

# **'The Black Diamonds of Bahia (Carbonados) and the Building of Euro-America: A Half- century Supply Monopoly (1880s-1930s)'**

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# The Black Diamonds of Bahia (*Carbonados*) and the Building of Euro-America: A Half-century Supply Monopoly (1880-1930s)

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## Introduction: the world context for a derived demand

Two singular events provide the context to the story of Brazil's black diamonds:<sup>1</sup> the second industrial revolution and the First World War. The second industrial revolution (1870-1914) coincided almost exactly with Brazil's carbon boom. With its new core industries like steel and petroleum, it generated a huge derived demand for industrial diamonds used in shaping steel, drilling for oil and other minerals, etcetera. Powerful demand-pull forces emanating from the United States and Western Europe – from their burgeoning automobile industries, underground transportation systems (tunnels, metros), skyscrapers, the drilling for petroleum and iron ore – during 1880-1930 fed back upon Bahia leading to the region's black diamond (or *carbonado*) cycle. The Great War opened up Brazil to American investments by severing Brazil's ties with Britain, Germany and France: "the war emergency turned the investment tide...stimulating a demand for American goods and particularly for American credit."<sup>2</sup> Though crucial to many industrial and civil construction activities at the time, Bahia's black diamond has received scant mention in the academic literature. Bahia's most famous economist, Romulo Barreto de Almeida, makes only brief mention of *carbonados* in his historical survey of the Bahian economy, as does Katia M. de Queiros Mattoso; while Noelio Dantas de Spinola devoted one paragraph to Bahia's diamond trade.<sup>3</sup>

Traditional Brazilian exports such as coffee, tobacco and hides and skins, continued to figure importantly at the turn of the twentieth century, but Brazil developed a monopoly of the black diamond trade. An annual average of 228,138 carats (or 46,942 grams) of diamonds were exported from Bahia during 1855-65, while annual exports to Europe averaged 178,326

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<sup>1</sup> The term '*carbonado*' is believed to date to 1842-43, used by Brazilian miners to designate an opaque, black or dark grey polycrystalline diamond found in the Chapada highlands of Brazil. Members of the new local diamond aristocracy included Coronel Jose Martins da Rocha, on whose lands 'black' diamonds were first found.

<sup>2</sup> Robert William Dunn, *American Foreign Investments*, New York: The Viking Press, 1926, p.4 The result was a huge inflow during 1913-1929 of US investment into government, state and municipal bonds, mining (manganese), meat packing, public utilities, banking, and all types of manufacturing (like cars, radios, Victor talking machines, etc.). The US share of total foreign private direct investment in Brazil went from 4.2% in 1914 to 13.9% in 1930, whereas that of Britain declined from 50.8% to 42.1% and France's share fell from 32.6% to 9.9% (Eric N. Baklanoff, 'External Factors in the Economic Development of Brazil's Heartland: The Center-South, 1850-1930', in Eric N. Baklanoff (ed), *The Shaping of Modern Brazil*, Baton Rouge: Louisiana State University Press, 1969, pp.26-9).

<sup>3</sup> Romulo Barreto de Almeida, 'Tracos da Historia Economica da Bahia no Ultimo Seculo e Meio', *Revista de Economia e Finances*, 4:4 (1952), pp.60-78; Katia M. de Queiros Mattoso, *Bahia: A Cidade do Salvador e Seu Mercado no Seculo XIX*, Salvador: Editora Hucitec, 1978, p.241; Noelio Dantas le Spinola, *A Trilha Perdida Caminhos e Descaminhos do Desenvolvimento Baiano no Seculo XX*, Salvador: UNIFACS, 2009, p.57. A very superficial essay was published in the premier jornal of Bahia in 2006 by Eptacio Pedreira de Cerqueira, 'Ocorrencia do diamante na Bahia', *Revista do Instituto Geografico e Historico da Bahia* 101 (2006), pp. 113-123. A feature issue of Bahia's major daily newspaper was devoted to diamonds in the Chapada region, but made no mention of black diamonds, 'Brilho Diamantino', *Correio da Bahai*, 19 September 2004, pp. 1-7.

carats in 1859-66.<sup>4</sup> The peak year was 1856, when 320,000 diamond carats were exported from Bahia to Liverpool and thence on to Amsterdam's Jewish diamond cutting firms.<sup>5</sup> Bauer estimated Chapada diamond during 1850-85 at 1.5 million carats, or about 43,000 carats on average per year.<sup>6</sup> Another estimate reported that Brazilian diamond output in the early 1880s was 25-30,000 carats per year.<sup>7</sup> Exports of diamonds resumed an upward trend in the 1880s when the Brazilian *carbonado* cycle began as the demand for diamond-headed rock drills grew rapidly. The share of diamonds in Bahia's exports rose from 4.2 percent in 1880/81 to 11.8 percent in 1911, making this the region's fourth largest export commodity (see Table 1).

**Table 1: The Mix of Bahia's Exports by Value in %, 1846 – 1911**

Sources: Macgregor (1850), p.198; Edes (1867), p.531; Edes (1878), p.126; Prindle (1883), pp.624-5; Burke (1890), p.84; Medhurst (1901), p.12; Demers (1908), p.16; Sinclair (1913), p.8

Commodity	1846	1864	1877	1880/81	1888	1900	1906	1911
Sugar	64.7	41.2	34.9	41.8	21.4	2.3	~0	~0
Coffee	3.5	9.2	19.2	12.3	15.6	13.1	11.3	15.0
Cotton	3.5	8.1	0.2	0	-	0	0	0
Cocoa	~0	1.3	3.2	5.0	6.6	27.3	33.9	34.4
Hides & Skins	7.5	2.3	3.1	4.9	2.8	4.4	8.0	5.8
Rum	4.1	2.3	0.8	0.3	0.1	0	0	0
Tobacco	7.8	21.3	29.2	**21.1	40.3	46.8	24.0	17.0
Diamonds	~0	****11.3	2.1	4.2	3.2	***	4.7(1907)	11.8
Brazil Wood	0.4	*1.6	0.7	0.5	*	*0.2	*0.1	*0.2
Rose Wood	?	*	2.3	1.8	*0.8	*	*	*
Piassava	?	0.8	2.9	8.0	9.0	1.3	1.0	0.8
India Rubber	0	0	0.2	-	-	0.7	14.4	8.8
Others	-	0.6	1.2	-	0.1	4.4	4.5	6.2
Total	100%	100%	100%	100%	100%	100%	100%	100%

\* These items are grouped together.

\*\*Consul G. A. Stevens (1885, p.1656) noted that in 1883/84 the quantity of tobacco exported was 15,644,010 kilos valued at 341,840 pounds, which accounted for about 30% of Bahia's exports in that year.

\*\*\* Production in 1900 was estimated at 40,000 carats for both Bahia and Minas Gerais (Medhurst 1901).

\*\*\*\* Consul Richard A. Edes (1867, p.531) reported that Bahian diamond exports were valued in 1864 at \$1,476,900 or \$770,000, accounting for 11.3% of the state's exports.

The exports of all diamonds from Bahia were reported at 8,269 grams in 1878/9 worth 709,323 milreis (or 62,640 pound sterling) and totalling 4.4 percent of total exports, with France receiving 81 percent and the United Kingdom 18.8 percent.<sup>8</sup> Prior to the First World War, carbons were panned from the streams in Bahia and sold to local middlemen and

<sup>4</sup> Antonio Joaquim de Souza Carneiro, *Riquezas Mineradas do Estado da Bahia*, Bahia: Litho-Typ Encadernacao Reis & C., 1908, p.26 and *New York Times*, 19 July 1867. Diamond measurements are an eighth (or an oitava) = 17.5 carats = 70 grains (one carat = 4 grains); 1 gram = 4.88 carats.

<sup>5</sup> George Westerman, *Jahrbuch der Illustrierten Deutschen Monatshefte: Band 16*, Braunschweig: Druck und Verlag, 1864, p.511.

<sup>6</sup> Max Bauer, *Precious Stones*, New York: Dover Publications, 1968 [1904], p.179.

<sup>7</sup> David Christopher Davies, *A Treatise on Earthy and Other Minerals and Mining*, London: Crosby, Lockwood & Co., 1884, p. 186.

<sup>8</sup> Consul Morgan, 'Brazil. Bahia', *Reports from Her Majesty's Consuls on the Manufactures, Commerce, & of their Consular Districts, Commercial Report No. 18* (1880), London: Harrison and Sons, 1880, p 467

exporters, who in turn sold them to European buyers for world distribution.<sup>9</sup> The *garimpero* either worked for himself in a group of other men, or on shares with owners of the claim. They lived in squalid huts and did their mining with the most rudimentary tools.<sup>10</sup>



**Figure 1: Panning for Carbons in Bahia, Brazil, c. 1915**

Source: Advertisement of the Diamond Drill Carbon Co. in Walter Harvey Weed, *The Mines Handbook*, New York: W.H. Weed, 1918, p. xvi

This paper traces the birth, maturity and decline of what was Bahia's natural supply monopoly of black or industrial diamonds: first used in polishing materials (for consumption); then in drilling; and by 1940 they were employed in making parts for the Third Reich's premier fighter plane, the Messerschmitt bF 109. The evolution in the way these stones were produced, the agents involved in production and distribution, and how the income was distributed along the commodity chain are examined. The importance of technological change is documented with the huge boost in demand for industrial diamonds when the Leschot diamond-head drill was invented (1863). The First World War cut off Bahia from traditional intermediaries and opened up a space for North American capital. A great surge in black diamond production in Bahia was led by the Bandler Corporation of New York, which introduced modern machine-based mining in the late 1920s; but the Great Depression doomed

<sup>9</sup> W. B. Stanley & Burton E. Anderson, 'Placer Diamond Mining in Brazil', *Mining & Metallurgy* 13:307 (July 1932), p.313.

<sup>10</sup> Charles Nicholls Webb, 'Drill Diamonds and Diamond Drilling', *Popular Mechanics Magazine* 39, 3, May 1932, p.213.

the venture. Between 1931 and 1941, keen secret competition arose to secure access to Bahia's diamonds between the rising Axis and the Allied powers given the crucial role these stones played in making the modern weapons of war.

The first section analyses the emergence of Brazil's natural monopoly in black diamonds. The second points out the crucial importance technological change (the Leschot diamond-head drill). The next section develops a unique analysis of how earnings were distributed along the black diamond commodity chain at the turn of the twentieth century. The final section underscores how the Great War created a vacuum into which North American capital plunged, such that by the late 1920s for the first time modern machinery was being used for the mass production of black diamonds in Brazil. While the Great Depression frustrated these efforts, the looming Axis and Allied contenders carried out secret schemes to secure Brazil's black diamonds so central to the execution of modern war.

### **The birth of Brazil's natural monopoly in *carbonados***<sup>11</sup>

Bahia developed a monopoly in the production of *carbonados* or industrial diamonds used in drills and for abrasive purposes.<sup>12</sup> Up until around 1850, the black diamonds were tossed away as waste, and the origin of extracting them remains disputed, though they were reportedly first gathered in the mines of Baranco, Grupiara, Gruna de Mosquitos and Surua in the Sincora mountain range around 1845-46.<sup>13</sup> Another source mentions *carbonados* being first found in diamond placers in the San Jose district of Sincora in 1843, but were not collected until 1846,<sup>14</sup> after which date they were initially shipped to Holland. US Consul Furniss in Bahia reported that the black or carbon diamond seemed to date back to 1848, when a Frenchman traveling through Bahia bought some for 27 cents a carat under the name of '*ferragens*' (or iron stones). An early purchaser of black diamonds was the Frenchman, A. Chibaribere, who in 1843 bought the stones in Andarahy for 160 reis per eighth (or a pittance of 9 reis per carat).<sup>15</sup> In March 1856, Domingo Gomes from Roncador near Lencois sold 6,475 carats in London that he had bought for 60 cents per carat and sold for \$1.26 a carat. The stones were pounded into dust and used in diamond polishing as well as in grinding wheels.<sup>16</sup>

Black diamonds were found along with white diamonds in the gravel beds of the Rio Paraguassu and its tributaries (Rio San Antonio, Rio Mucuge) lodged in gravel known locally as *cascalho*.<sup>17</sup> Owners and leasers of diamond lands allowed miners to work their properties, with the latter receiving from one-fifth to one-fourth of the value of their finds,<sup>18</sup> which could be used to offset debt accumulated by purchasing provisions from the mine-claim owner.

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<sup>11</sup> An excellent short review is provided in W. N. P. Reed, 'Brazil's Natural Monopoly: The Carbonado', *Engineering and Mining Journal* 130, 6, September 23, 1930, pp. 289-93.

<sup>12</sup> Antonio Joaquim de Souza Carneiro, *Riquezas Mineraes do Estado da Bahia*, Bahia: Litho-Typ Encadernacao Reis and C., 1908. A valuable account of the diamond region around Lencois has been provided Nadir Ganem, *Lencois de Outras Eras II*, Brasilia: Thesaurus, 2001, p.140. See also Walfrido Moraes, *Jaguncos e Herois: A Civilizacao do Diamante nas Lavras da Bahia*, Rio de Janeiro: Editora Civilizacao Brasileira, 1963.

<sup>13</sup> Alfred des Cloizeau, *Manuel de Mineralogie*, Vol.II, Paris: Ch. Dunod, 1893, p.22.

<sup>14</sup> 'Recorded Occurrences of Carbonado', *The American Mineralogist* 33 (1948), p.252.

<sup>15</sup> Moraes (1963), p.19

<sup>16</sup> H. W. Furniss, 'Diamonds and Carbons in Brazil', *Popular Science Monthly*, 69 (September 1906), p.273.

<sup>17</sup> *New York Times*, 9 February 1908; A. P. W. Betim, 'Considerations sur les gisements de diamants du Bresil', *Bulletin de la Societe Francaise de Mineralogie* 52 (1929), pp.51-5.

<sup>18</sup> J. P. W. Rowe, 'Carbonados', in Walter Renton Ingalls (ed.), *The Mineral Industry Its Statistics, Technology and Trade during 1907*, New York: Hill Publishing Company, 1908, p.146.

Diamonds were also mined by claims owners employing slave labour.<sup>19</sup> Calvert reported that in the Bahia diamond fields, better-off persons bought the placer claims and:

secure perhaps 25 per cent, for allowing more impecunious miners to do the rough work. They take good care, however, to wash the pay dirt themselves, or to entrust this task to those whose good faith they have confidence.<sup>20</sup>

Slave labour was extensively employed in the mines of the Chapada.<sup>21</sup> The number of miners involved in Bahia's diamond activity fell from 20,000 in 1845 to about 5,000 in 1901.

Early diamond towns included Santa Isabel, Chique-Chique, Andarahy and Lencoes.<sup>22</sup> The riverbed gravel (*cascalho*) was removed by native divers, brought to the river banks, washed and sorted (see Figure 1). The mining methods employed during the nineteenth century were very simple and the hard work done by native miners (called *garimperos*). Most workers engaged in the mining of diamonds in Bahia (unlike in Minas Gerais) were free labourers, not slaves.<sup>23</sup> *Garimperos* flocked to the region on their own will hoping to strike it rich. A report dated 1857 described the labour process in the Chapada:

The labour expended in collecting that small bag of dull glassy stones is immense. One can easily lift with the hand the product of a year's digging and washing; yet to bring them together, much sweat has flowed while the steaming negroes dug the clay under a burning tropical sun. The whip has many a time roused the flagging energies, or sharpened the search among the gravel in the washing-trough.<sup>24</sup>

An 1898 report noted:

The small supply is due to the crude methods. Frequently two men obtain only three or four carbons in six months' work. The carbons are bought by agents of the exporters in Bahia.<sup>25</sup>

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<sup>19</sup> Maria Cristina Dantas Pina, 'Santa Isabel do Paraguassu: Cidade, Garimpo e Escravidao nas Lavras Diamantinas, Seculo XIX', Masters thesis, Universidade Federal da Bahia, 2000.

<sup>20</sup> Albert F. Calvert, 'The Bahia Diamond Fields', in *Mineral Resources of Minas Geraes (Brazil)*, London: E. & F. N. Spon, 1915, p.81.

<sup>21</sup> Hugh Pearson, 'The Diamond Fields of Brazil', *Journal of the Royal Society of Arts* 58:2978 (7 December 1909), pp.101-129.

<sup>22</sup> The most authoritative report on diamonds in Bahia at the time was written by H. W. Furniss, U.S. Consul in Bahia, and reproduced in *The Jewelers' Circular Weekly* issues of 27 August, 3 & 10 September 1902.

<sup>23</sup> Maria Cristina Dantas Pino, 'Os Negros do Diamante: Escravidao no Sertao das Lavras Diamantinas – Seculo XIX', *Politeia – Historia e Sociedade*, 1:1 2001, pp. 179-200.

<sup>24</sup> 'Diamond Washing and Cutting', *The Eclectic Magazine of Foreign Literature, Science, and Art*, 40:1 (January 1857), p.139.

<sup>25</sup> Richard P. Rothwell, 'Gems and Precious Stones', in *The Mineral Industry, Its Statistics, Technology and Trade, in the United States and Other Countries to the End of 1898*, New York and London: The Scientific Publishing Company, 1898, p.276.



**Figure 2: Garimpos concentrating cascalho with hoes in ditches of water.**

Source: Photograph taken by H. W. Furniss, in Orville A. Derby, 'The Geology of the Diamond and Carbonado Washings of Bahia, Brazil', *Annual Report of the Smithsonian Institution*, 1906, Washington DC: Government Printing Office, 1907, p.218.

Prices in Britain for *carbonados* rose fifty-fold during 1870-1909, from 2 shillings per carat in 1870-2, to two pounds sterling in 1895 per carat, and to five pounds sterling in 1909.<sup>26</sup> But, even though the field price of carbons rose significantly during the 1890s, the supply response was small because of the 'defective methods of working'.<sup>27</sup>

The mining was all done by black or mixed race native miners who either worked independently or on a share basis with the claim owner. The work was physically draining, dangerous and the *garimpeiros* survived barely at or below subsistence level, often in debt servitude to the claims owner who provided simple tools, clothing and food, driven by hope of a richer tomorrow. A report in 1898 explained the existing carbon mining methods:

To obtain those in the river bed, a place is selected not more than 20 feet in depth and with a slow current. In this place a pole is planted, down which naked native divers descend, taking with them a sack which is kept open at the top with a ring. They first scrape away the silt and then fill the sack with the underlying gravel, removing it entirely down to the clay (bedrock). As soon as the sack is full, a signal is sent up to a man who is waiting in one of the native boats or canoes which are chiselled out of a tree. The bag is raised to the surface, taken to

<sup>26</sup> 'Carbons/Black Diamonds for Diamond Drills', *Mining Science*, 21 October 1909, p. 366.

<sup>27</sup> David T. Day, 'Brazil', *Mineral Resources of the United States. Calendar Year 1902*, Washington: Department of the Interior, United States Geological Survey, U.S. Government Printing Office, 1904, p 819.

the shore, and dumped at a sufficient distance to prevent its being washed away by any sudden rise of the river. This operation is repeated day by day during the six months which constitute the dry season, after which diving has to be suspended...the divers are quite skilful, and many of them remain below for a minute at a time, some even remaining as long as a minute and a half...the other method of mining consists of drilling through the rock of the mountain side, and removing the diamond and carbon bearing gravel through a series of tunnels. This gravel is piled up on the side of the mountain during the dry season and is then washed during the rainy season by means of sluices through which the water is conveyed down the mountain side.<sup>28</sup>

In other locales especially on the Paraguassu River from Joao Amaro to Andarahy, another method was employed,

The miners use diving machines, probably movable caissons, in which a man can work for several hours on the river bottom. Under cover of one of these, two men work alternately it is said, in three-hour shifts, gathering the cascalho into sacks lowered to them from the surface. Others dive for the cascalho much the same as the pearl divers dive on the pearl banks, gathering as much of the gravel as they can during the submergence. In the shallows, others drag the gravel into the mouths of sacks with their feet. The diamondiferous material is found not only in the beds of the streams and rivers, but also in fissures and gullies in the rocks which bank the valleys of the water-courses, as in the other Brazilian fields. The sands and gravels are gathered from the beds of the streams in dry seasons, and from fissures and beds in the rocks during the wet seasons. The richest finds are made usually in pot-holes in the river beds.<sup>29</sup>

Prices offered to miners in the Chapada were determined by telegraph cable from abroad (regulated by the forces of supply and demand). Dr. Hartwig summarised the situation in 1871 as:

The miners rarely make a fortune, as their expenses are very great; the chief profits of the diamond trade fall to the share of merchants, who purchase the stones in the mining districts and then sort and export them. The price of diamonds is subject to considerable fluctuations, which, proceeding from the markets of London, Paris, and Amsterdam, are most sensibly felt in the diamond districts, for the great European houses in whose hands the trade of the rough stones is concentrated, and who dispose of considerable capital, are able to wait for better times, while the small Brazilian trader or miner is soon obliged, for want of money, to sell his stones at any price.<sup>30</sup>

These purchasing firms sent out buyers into the diamond areas, with purchases often amounting to over 300,000 milreis (\$100,000) a month. US Consul Albert Morawetz of Bahia noted that the purchasing firms were either branches of French merchant houses or they shipped to firms in London and Paris on joint account. Carbons were not brought to Salvador for sale, but were purchased in the interior by agents and dealers. No companies were engaged

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<sup>28</sup> *Jewelers' Circular*, 26 October 1898.

<sup>29</sup> From a 1911 document, *Diamonds Mines of Brazil*, at <http://www.oldandsold.com/articles21/diamond-9.shtml>.

<sup>30</sup> Dr. George Hartwig, *The Subterranean World*, London: Longmans, Green, and Co., 1871, p. 483.



in mining or searching for carbons, that work being done by the natives, individuals or in small parties working together. Purchase prices were not controlled by a trust but instead governed by the forces of supply and demand.<sup>31</sup>

Mine-claims owners were local landlords, emigrant men of property, merchants, storekeepers, politicians and military officers. The diamond-land owners then sold the gemstone diamonds to buyers from Salvador da Bahia, who shipped the stones to London or Paris, often being sent then to Amsterdam or Antwerp for cutting.<sup>32</sup> A similar commodity chain existed with diamonds from Minas Gerais, which went to Rio and thence to Paris and London.<sup>33</sup> As of the 1850s (and expiration of the British-Portuguese treaty of 1810), large commercial houses from Paris sent representatives to Bahia and Rio de Janeiro to purchase uncut diamonds, establishing Paris as the primary destination for Brazilian diamonds.<sup>34</sup> The post-colonial Brazilian imperial government allowed diamond mining by private enterprise. But after expiration of the Anglo-Brazilian trade treaty in 1844, which mandated all Brazilian diamonds be shipped to London, Brazil's diamonds increasingly were purchased by French houses and placed on the Paris market. The Chapada alluvial mines existed entirely outside the later control of the De Beers syndicate because they used small-scale placer alluvial mining defying central control and because the Brazilian output was marginal compared to De Beer's' South African output.

Two kinds of diamonds – *carbonados* and *borts* – were used for diamond drill work. The *carbonado* was only found in Bahia, Brazil. The *bort* is a semitransparent stone, less tough and with a different crystallisation than the *carbonado*. The much cheaper *borts* can be used for softer rocks. The *carbonado* is opaque and black on the outside and of irregular shape. It has no cleavage planes, which differentiates it from gemstone diamonds. It is very hard and ideally suited for drilling into hard rock.<sup>35</sup>

### **Appearance of the Leschot diamond-head drill**

Up until the eighteenth century, the non-jewellery uses of diamonds were as splinters for engraving, boring, the cutting of gems, glass and other hard metals, and as crushed *bort* powder on rotating iron laps for shaping gems, engraving, etc. Modern abrasive and cutting applications came to include drilling, truing and grinding.<sup>36</sup> Diamond rock drills of a rudimentary nature were employed in the early eighteenth century. Large diamond drills for the mining industry were being used extensively in the later nineteenth century and go back to Leschot of Geneva in 1862. His diamond core drill was patented in 1863.<sup>37</sup> The Brazilian black diamond was first used to cut millstones in North America, reportedly by the firm of

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<sup>31</sup> *Ores and Metals*, 20 June 1907.

<sup>32</sup> *Travaux de la Commission sur l'Industrie des Nations, Publies Par Ordre de l'Empreur. Exposition Universelle de 1851, Tome 1*, Paris: Imprimerie Imperiale, 1858, p. 859

<sup>33</sup> *Jewelers' Circular* 17 May 1899.

<sup>34</sup> Henri Jacobs & Nicolas Chatrian, *Monographie du Diamant*, Antwerp and Paris: Librairie Universelle de Louis Legros, 1880, p. 111

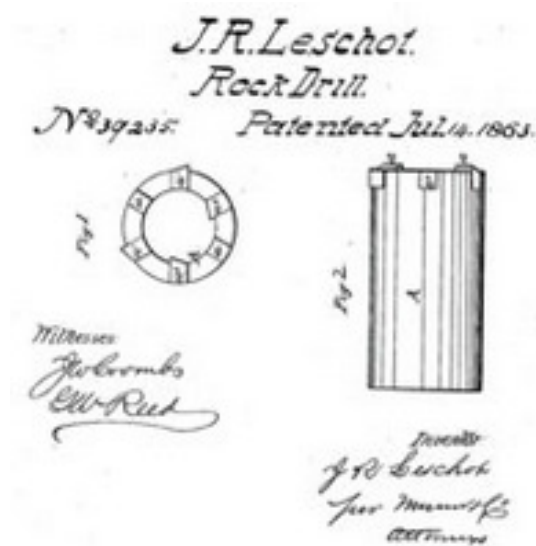
<sup>35</sup> 'Boring with Diamond Drill', in *International Library of Technology*, Scranton: International Textbook Company, 1907, p.38.

<sup>36</sup> The history of these applications is examined in Samuel Tolansky, *The History and Use of the Diamond*, London: Methuen, 1962. See also Douglas T. Hamilton, 'Grinding Wheel Truing Devices', *Machinery*, 22 (November 1915), pp.220-8.

<sup>37</sup> Samuel T. Pees, 'Inventor and History', *Oil History*, no date at <http://www.petroleumhistory.org/OilHistory/pages/Diamond/inventor.html> .

Dessau and Co. (established in New York in 1848).<sup>38</sup> *The Engineering and Mining Journal* reported that carbons had first been brought to the London diamond market around 1867 but was deemed worthless; but that Dessau was importing Bahia black diamonds in 1882 for use in diamond drills.<sup>39</sup>

The carbons' value as an abrasive was increasingly recognised in the mid-nineteenth century. Until the invention of the Leschot diamond-headed rock drill in a famous watch factory in Geneva (Vacheron and Constantin) by the Swiss engineer, George-Auguste Leschot and his son, Rodolphe, *carbonados* were of little value. But the intense hardness of the *carbonado* was recognised. The diamond-tipped core drill was used first for drilling blast holes for transalpine tunnelling at Mount Cenis and later the St. Gothard on the French-Italian border, the Suez and Panama canals, the two major Trans-Andean railways in South America (the Oroya in Peru and the Chilo-Argentine), the London Underground, oil wells in Pennsylvania, the 75-foot deep holes in which support structures for the world's largest building in 1913, the Equitable in New York. The first diamond-drill hole in the United States was put down in north-eastern Pennsylvania for the purpose of prospecting for anthracite coal.<sup>40</sup>



**Figure 3: The original Leschot rock drill patent.**

Source: United States Patent Office, 'Rodolphe Leschot, of Paris, France. Tool for Boring Rock', Letters Patent No. 39235, July 14, 1863

Leschot mounted four carbons in the crown of his drill which was then rotated at 250-300 rpm. In an early experiment carried out in Rheinfelden, Switzerland, the Leschot drill took 60 days to perforate 475 meters, a task which before the invention would have taken between two and three years.<sup>41</sup> Soon afterwards, when the commercial value of black diamonds became recognised, an enterprise in London, Diamond Rock Boring, and in the United States the Bullock Machinery Co. and Sullivan Machinery Co., also joined in the

<sup>38</sup> Karl E. Spear & John P. Dismuke (eds), *Synthetic Diamonds: Emerging CVD Science and Technology*, New York: John Wiley & Sons Inc., 1994, p.509.

<sup>39</sup> *Engineering and Mining Journal* 11 March 1882, p. 132.

<sup>40</sup> I.C.S. Reference Library 'Boring with Diamond Drill', in *International Library of Technology*, Scranton: International Textbook Company, 1907, p.47.

<sup>41</sup> M. Jacobs & N. Chatrian, 'Sur la taille du diamante et l'emploi industriel du *carbonado*', *Bulletin Hebdomadaire de l'Association Scientifique de France*, 8: 204-205 (24 February-2 March 1884), pp.337-42.

exploitation of the Leschot patented drill. Uses of diamonds in steel machinery multiplied. By the 1920s diamonds were being used to help build bridges, skyscrapers, appliances, etc.<sup>42</sup>

During the US Civil War black diamonds packed in herring barrels sold for twenty-five cents a carat.<sup>43</sup> The price of carbons in London during 1870-72, when they were being used mostly for polishing white diamonds or as an abrasive for cutting, was 2 shillings a carat. This rose to 8-16 shillings a carat in 1875, to 40 shillings a carat in 1895 and to 100 shillings a carat in 1909. Between 1895 and 1909, the market value of a *carbonado* fluctuated between \$25 and \$85 a carat. In other words, over the period 1870-1906, the price of carbons rose some fifty-fold.<sup>44</sup> Consul Furniss reported upon the demand-induced price rise of carbons from \$17 a carat in 1892 to \$60 in New York in 1906.<sup>45</sup> In 1915, Brazilian *bort* was selling in New York for \$15/carat and *carbonado* for \$75/carat.<sup>46</sup> Another source quoted prices reported at the U.S consulate in Salvador in 1915 as being \$18 per carat for gem diamonds and \$32 for *carbonados*.<sup>47</sup> By mid-1920 the carbon price in New York was over \$100 per carat. A revival of outside interest in Brazilian diamond fields took place in the later 1890s as the world price of rough diamonds controlled by the De Beers London Diamond Syndicate doubled.<sup>48</sup>

During the 1880s Bahia began its *carbonado* cycle. Bahia dominated black diamond production with small amounts being mined in neighbouring Minas Gerais and Landak in Borneo. World market prices for black diamonds soared during 1860-1900: in 1860, the price was 2,000 milreis per kilo, by 1896 it was 80,000 milreis and by 1930 an incredible 1,200,000 milreis per kilo.<sup>49</sup> Annual output during 1850-70 had been 70,000 carats.<sup>50</sup> The New York price for carbons was \$17 a carat in 1892 and \$75 in 1906. In 1912, a black diamond sold by a miner cost \$5 per carat; a brilliant diamond of good colour and shape earned the miner \$11.25 per carat.<sup>51</sup> During 1845-1907, the estimated diamond output of Bahia was 2,642 kilograms.<sup>52</sup> The largest *carbonado* was discovered in 1895 in Lencois and weighed 3,148 carats (see Figure 2). Other gemstones were also found, such as tourmalines, quartz and rutile. The diamond wealth generated there formed the material basis for the “*coroneis de pedra*”.<sup>53</sup> The boom lasted for about 25 years, with manual washing of diamonds beginning to decline from 1871 onwards. However, in 1880 the engineer Theodoro Sampaio visited the town of Santa Isabel do Paraguassu (now Mucuge) located in the Sincora range and still observed *garimpero* washing in the Paraguassu River.<sup>54</sup> The first attempts to mechanise diamond washing took place in the early twentieth century.<sup>55</sup> In an article published in Bahia in 1905, Pereira noted

<sup>42</sup> *New York Times*, 24 December 1924.

<sup>43</sup> ‘The King of the Black Diamond’, *Popular Mechanics Magazine* 56, 6, December 1931, p. 984

<sup>44</sup> *Mining Science*, 21 October 1909.

<sup>45</sup> Mantell presents data on retail prices of *carbonado* per carat for 1879-1926 (in C. L. Mantell, *Industrial Carbon*, New York: D. Van Nostrand, 1928, p.15).

<sup>46</sup> *Machinery* (NYC) 22, 1916, p. 246-54.

<sup>47</sup> Consul Robert Fraser, Jr., ‘Bahia’s Trade in Diamonds and Carbonados’, *Commerce Reports* 1:41, Washington: Bureau of Foreign and Domestic Commerce, U.S. Department of Commerce, 1916, p. 675.

<sup>48</sup> Wallis Richard Cattle, *The Diamond*, London & New York: John Lane, 1911, p.204.

<sup>49</sup> Julio Guedes, ‘O carbonato, historico e decadencia do seocomercio’, *Revista da Bahia*, 1:5 (March 1936), p.107.

<sup>50</sup> Darcy P. Svisero, ‘Distribution and Origin of Diamonds in Brazil: An Overview’, *Journal of Geodynamics*, 20:4 (1955), p.499.

<sup>51</sup> *Mining and Scientific Press*, 12 August 1912.

<sup>52</sup> Carneiro (1908), pp.26-7.

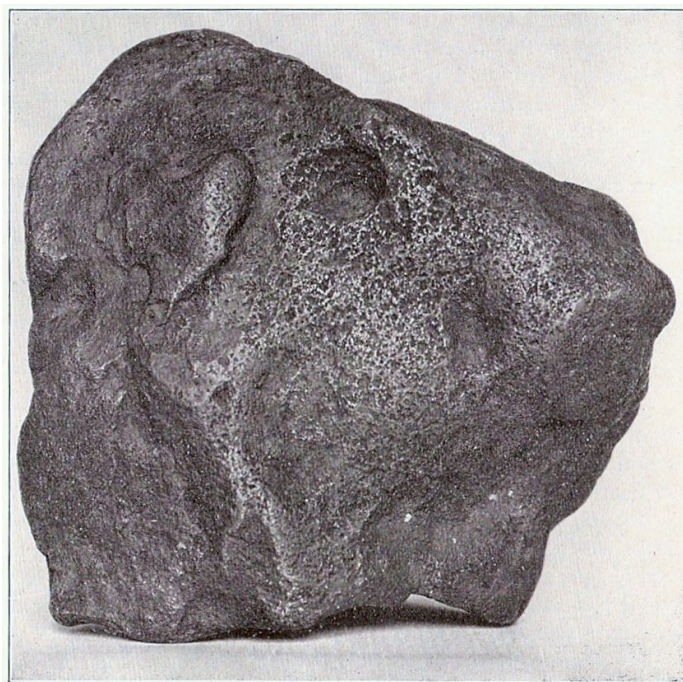
<sup>53</sup> *Correio da Bahia*, 22 December 2004, at <http://www.correiodabahia.com.br/2004/12/22/noticia.asp?link=not000103073.xml> .

<sup>54</sup> Theodoro Sampaio, *O Rio Sao Francisco e a ChapadaDiamantina*, Salvador: Livraria Progress, 1955.

<sup>55</sup> J. M. Catarino, *Garimpo-Garimpeiro-Garimpagem, Chapada Diamantina, Bahia*, Rio de Janeiro: Philobliblion/Banco Economico, 1986, p.270.

that two foreign companies were exploring for carbons in the riverbed of the Rio Paraguassu using modern machinery.<sup>56</sup>

Carbons were found in all sizes, varying from that of a grain of sand to one of 975 carats in 1894. Other large *carbonados* found in Bahia were a stone weighing 3,078 carats in 1895 and one of 750.5 in 1901.<sup>57</sup> The most valuable were those in the 1-3 carats range because larger ones needed to be broken apart at a great volume loss. A black diamond of 3,148 carats was found in Lencois in 1895 by a miner, Sergio Borges de Carvalho. It was first sold for \$16,000, later for \$25,000 when taken to Joalheria Kahn and Co. of Bahia which in turn shipped it to G. Kahn in Paris, who sold it to I. K. Gulland of London in September 1895 for £6,400. The stone was broken up into small pieces of 3-6 carats each to be used in industrial diamond drills.<sup>58</sup> Another large carbon weighing 577 carats was found close to the same place near Lencois in 1901 and was sold by the miner for 79,000 milreis (or \$17,380), a quarter going to the lessee.<sup>59</sup> A large carbon weighing 52 carats was also found in Lencois and was held by its owner for two years while waiting for a good price. The stone was sold in early 1906 for 90 *contos de reis* (\$30,000) and was shipped to Paris.<sup>60</sup>



**Figure 4: The largest carbonado ever found, the 3,148 carats Sergio**

Source: Furniss (1906), p.274. The Sergio was smashed into small pieces in New York and used in drills at the Mesabi Range, the vast iron deposit in Minnesota.

<sup>56</sup> Goncalo de Athayde Pereira, 'Memoria Historica e Decriptiva do Municipio do S. Joao do Paraguassu', *Revista do Instituto Geografico e Historico da Bahia* 12:31, 1905, p. 140

<sup>57</sup> *American Journal of Science*, 16 (November 1903), p.399.

<sup>58</sup> F. M. de Souza Aguiar, *Brazil at the Louisiana Purchase Exposition, St. Louis 1904*, St. Louis: Samuel F. Myerson Printing Co., 1904, p.30.

<sup>59</sup> *Jewelers' Circular*, 10 September 1902.

<sup>60</sup> 'Mines and Minerals. The World's Output, Brazil', *Monthly Consular and Trade Reports* No.329 (February 1908), p. 129.

In each town of the diamond-mining district, agent buyers representing the larger Bahia City export firms in the carbon and diamond business were active.<sup>61</sup> Ever since the discovery of these diamonds in Brazil, this commerce had been a monopoly in the hands of native firms, who had associated themselves with French and German Jewish firms in Paris and London. Before the Great War, most diamonds went to London or Paris and thence to Amsterdam and Antwerp for cutting.<sup>62</sup> Jewish dominance was to be expected as Jews “practically monopolized trade in articles of luxury...jewelery, precious stones, pearls and silks”.<sup>63</sup> According to the US vice-consul in Bahia, J. P. W. Rowe, five to six such firms dominated the diamond-exporting trade of Bahia; my research indicates these firms were M. Ulmann and Cia (Paris), Maison Levy Freres (founded in Paris in 1885) and Nathan & Levy, Arthur Lodin (Paris), Joalheria C. Kahn and Co. of Bahia, J. Sanders, Theophilio Gomes de Mattos and Coronel Francisco de Mello and Co.<sup>64</sup> The latter two were reportedly the largest exporters of carbons at the turn of the century.<sup>65</sup> The first five maintained offices in Bahia and Paris. The *carbonado* was first successfully used by the French engineer Leschot, in the drills for boring holes for blasting in the St. Gothard tunnel through the Alps. At the height of the Chapada Diamantina diamond boom centred around Lencois and Andarahy, the French were buying industrial diamonds to be used in drilling the Panama Canal (1881-1889), for the St. Gothard Tunnel, and for the London Underground (opened in 1863). German publications for 1904-5 list the following diamond-export merchants in Bahia: C. Kahn, Theophilio Gomes de Mattos, Coronel Francisco de Mello, Louis Leib, Ulmann and Co., Melchiades de Silva Veiga, and the prominent industrialist Joao Baptista Machado.<sup>66</sup> Jewish interests dominated the export diamond trade (Ulmann, Kahn, Levy, Lodin and Leib).

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<sup>61</sup> *Jewelers' Circular*, 10 September 1902.

<sup>62</sup> Herbert Jackson, ‘Was Your Diamond Cut in This Country?’ *Illustrated World*, 31:1 (March 1919), p.39.

<sup>63</sup> Werner Sombart, *The Jews and Modern Capitalism*, New York: E.P. Dutton & Company, 1913, p.25. The role of Jews in the world diamond industry is examined in Edward Jay Epstein, ‘The Jewish Connection’, in *The Rise and Fall of Diamonds. The Shattering of a Brilliant Illusion*, New York: Simon and Shuster, 1982, pp.76-87 and Salo Wittmayer et al., *Economic History of the Jews*, New York: Schocken Books, 1975.

<sup>64</sup> These latter two maintained offices on Salvador’s Rua Conselheiro Dantas at the turn of the century (‘Production of Carbons’, *Monthly Bulletin of the American Republics* Vol. 6 (1898), p.788). Others are cited in Paul Serre, ‘Au Pays du Carbone Amorphe’, *Bulletin du Museum Nationale d’Histoire Naturelle*, Paris: Imprimerie Nationale, 1913, p.136, who mentions the firms of Ulmann, Kahn, Sanders, Machado, and de Mattos, noting that the first three maintained offices also in Paris.

<sup>65</sup> *Jewelers' Circular*, 26 October 1898, p.7

<sup>66</sup> ‘Bahia Handelsbericht des Kaiserliches Konsulats fur das Jahr 1902’, *Deutsches Handels-Archiv. Zeitschrift fur Handel und Gewerbe, Zweitert Teil Jahrgang 1904*, Berlin: Verlag von Ernst Siegfried Mittler und Sohn, 1904, p.63, and in ‘Das Geschäft mit Diamanten im Staate Bahia’, *Berichte über Handel und Industrie Siebenter Band*, Berlin: Karl Hermanns Verlag, 1905, p.693. The Portuguese Machado family’s patriarch in Bahia was the prominent merchant, Manoel Jose Machado. The Machados became involved in commerce, diamond trading, *estaleiros*, textiles and sugar. Coronel Joao Baptista Machado joined Alvarao Catharino in founding the major sugar factory, Usina Cinco Rios, which operated from 1912 to 1930, when it was closed down and sold. Joao Baptista also shared ownership in textile factories with the prominent Bernardo Martins Catharino family.



**Figure 5: A typical mule caravan involved in Bahia's diamond trade**

Source: 'The King of the Black Diamond', *Popular Mechanics Magazine* 56, 6, December 1931, p. 984

### **How earnings were distributed along Bahia's black diamond commodity chain**

Before the Brazilian Imperial Central Bahia Railway line reached Bandeira de Mello in 1887,<sup>67</sup> it was an eight to ten days' journey from Sao Joao do Paraguassu to Sao Felix. The diamond region of Bahia was located about 267 miles from Salvador. It could be reached in four days of travel: Bahia to Cachoeira, 45 miles by water, one day; Cachoeira to Bandeira de Mello, 158 miles by rail, one day; and thence on to Andarahy, 64 miles on mule back, two days (Figure 5).

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<sup>67</sup> Francisco Antonio Zorzo, 'A Movimento de Trafego da Empresa da Estrada de Ferro Central da Bahia e Seu Impacto Commercial', *Sitenibus* (Feira de Santana), 26 (Jan/June 2002), pp.63-77.



**Figure 6: Map of the central region of the state of Bahia**

Source: Elpidio de Mesquita, *Viacao Ferrea da Bahia*, Rio de Janeiro: Typ. do Jornal do Commercio, Rodrigues & Co., 1910.

Given the widespread prevalence of diamond smuggling – as traders sought to evade the Bahia export tax – in Bahia, data on diamond exports is hard to come by. As much as 30 percent of total Brazilian output may have been smuggled out.<sup>68</sup> In 1885, Consul Stevens of Great Britain reported:

It is scarcely necessary to remark again that the (Salvador) Customs-House records of the exportation of diamonds convey no idea of the business done here in the article, which is mostly sent away without paying the (export) duty.<sup>69</sup>

Fourteen years late the same point was made by British Consul Nicolini, who assessed that the quantity of diamonds passed through the Customs House was:

not the tenth part of what is actually exported. These articles (precious stones) being of small bulk and great value, the quantity smuggled out of the country in order to escape

<sup>68</sup> V. A. Milashev, *Kimberlity Glubinnaia Geologiya*, Leningrad: Nedra, 1990.

<sup>69</sup> Stevens (1885), p.1645

the very heavy export duties, amounting to 500 milreis, or at present rate of exchange, to 15 shilling sterling per gramme, is enormous.<sup>70</sup>

And a year later, the U.S Consul H.W. Furniss echoed the sentiment noting first that diamond and carbon output had risen as the drought dried up rivers allowing more crude mining methods:

It was estimated that production was this year trebled, yet no one can estimate the value of production or even the amount of export, because the State puts a duty of 16 per cent on valuation besides the 1 per cent demanded by the municipality, but are smuggled out in baggage.<sup>71</sup>

In 1876, diamond exports amounted to two per cent of total Bahian exports valued at \$212,457; in 1878/79 \$319,195 or 4.4 percent of total exports (with 89 percent going to France and 19 percent to Britain); \$319,720 in 1880/81 or 4.1 percent of total export; and 4.7 percent of total exports in 1907 valued at \$590,459. In 1880/81, over 95 percent of exported Bahia's rough diamonds went to France (with the remainder destined for Britain).<sup>72</sup> The trade routes were complex, with the rough diamonds being shipped to Amsterdam for finishing, though cutting and polishing was carried out increasingly in Paris, London, Antwerp and soon New York.<sup>73</sup> For example, an 1885 report by the US consul in Amsterdam stated that American diamond buyers regularly visited Amsterdam, which was still a centre for the cutting and polishing of rough diamonds. They made large purchases, which they then either shipped or carried on their persons to Paris or London where several New York diamond importers maintained offices. They would sell the diamonds at a profit, some to the New York importers who then finally shipped the diamonds to the United States.<sup>74</sup> But *carbonados*, which required neither cutting nor polishing, were shipped directly to New York.

In the early 1900s, it was estimated that \$ 4.5 million worth of black diamonds flowed out of the port of Salvador annually.<sup>75</sup> A German source reported that exports of *carbonados* from Bahia were: in 1904, 573,503 milreis (\$183,521); in 1905, 356,784 milreis (\$114,701); and in 1906, 992,164 milreis (\$317,492),<sup>76</sup> no doubt a fraction of the true amount. According to British sources, the official value of diamonds and carbons exported from Bahia in 1906, upon which an export tax was levied, was only \$321,678; but these official figures represented an underestimate insofar "as it is well-known that most of the diamonds and *carbonatos* exported from Bahia year by year are smuggled out of the country in order to avoid the five per cent export duty." In 1905, the government of Bahia switched from an export tax of 7 percent on diamond exports, to a system where each diamond exporter would

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<sup>70</sup> Mr Consul Nicolini, 'Report on the Trade, Commerce, and Navigation of Bahia for the Years 1896, 1897, and 1898', *Diplomatic and Consular Reports* No. 2282 Annual Series, London: Printed for Her Majesty's Stationary Office, By Harrison and Sons, 1899, p. 6

<sup>71</sup> Consul H. A. Furniss, 'Brazil. Bahia', *Commercial Relations of the United States with Foreign Countries during 5th Year of 1988*, Vol. I, Washington: Government Printing Office, 1900, p. 601

<sup>72</sup> Consul Prindle, 'Bahia', *Report upon the Commercial Relations of the United States with Foreign Countries for the Years 1880 and 1881*, Washington DC: Government Printing Office, 1883, p.625.

<sup>73</sup> George Kunz, 'Geography of Precious Stones', *Journal of the Franklin Institute*, 145 (January 1898), p.32.

<sup>74</sup> U.S Consul D. Eckstein, 'Report by Consul Eckstein on the Trade and Commerce in Amsterdam in 1884', in *Reports from the Consuls of the United States on the Commerce, Manufactures, Etc., of Their Districts* 18:60 (January 1886), p.107.

<sup>75</sup> 'Diamonds and Their Bearing upon the Future of Brazil', *Bulletin of the International Bureau of the American Republics* (February 1909), p.240. .

<sup>76</sup> Eduard Johann Karl Dettman, 'Diamanten und Edelsteine', in *Brasiliens Aufschwung in Deutscher Beleuchtung*, Berlin: Hermann Paetel, 1908, p.161.



pay a flat annual fee 22 contos (15 contos for the state and 7 contos for the municipal government), each irrespective of amounts shipped. The switch was undertaken to capture revenues that were escaping because of smuggling. Data for 1906/7 indicate that the port of Salvador annually shipped out about 12-14 million milreis (or US\$3.9-4.6 million) worth of diamonds.<sup>77</sup> For Brazil as a whole, the true export of diamonds of every sort in 1906 was put conservatively at \$5 million.<sup>78</sup> British sources put the *carbonado* export figure from Bahia in 1909 at 1 million pounds;<sup>79</sup> and a US government publication in 1909 estimated that \$4-4.6 million worth of black diamonds was shipped annually out of the port of Salvador.<sup>80</sup>

Figure 7 computes a gross estimate of the revenues in the black diamond commodity chain for early years of the twentieth century. The chain starts with the miner and lease in the mining area. Carbon prices in the field rose significantly in the late 1800s: they were bought from miners from \$4 to \$4.40 per carat in 1894, rising to \$11 to \$11.20 in 1898.<sup>81</sup> In 1902, the purchase price of a good quality carbon from a miner was 5 pounds sterling/carat (or \$24), of which the miner kept a quarter whereas the claim owner retained \$18. The Bahia purchaser then shipped the carbon to New York, London or Paris. The New York price for a good 2-3 carats carbon stone in 1902 was \$48/carat (which had risen to \$75/carat by 1906).<sup>82</sup> The annual output of Bahia carbons was 2,500 carats/month or 30,000 carats/year. The intermediary traders based in Salvador and the New York carbon importer collected \$24/carat in 1902 and \$53 in 1906 (yellow-shaded area in Figure 7. Assuming Bahia's carbon output in 1902 amounted to 30,000 carbons, then some \$720,000 a year remained in Bahia (if the carbon price were \$75/carat as in 1906 and 1915, then that amount would be over \$1.5 million). The prominent New York trade journal *Machinery* reported that the 1915 price of *bort* was \$15/carat and \$75/carat for *carbonados*.<sup>83</sup>

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<sup>77</sup> 'Mines and Minerals. The World's Output, Brazil', *Monthly Consular and Trade Reports* No. 329 (February 1908), p.127.

<sup>78</sup> 'Diamonds and Their Bearing upon the Future of Brazil', *Bulletin of the International Bureau of the American Republics* (February 1909), p.252.

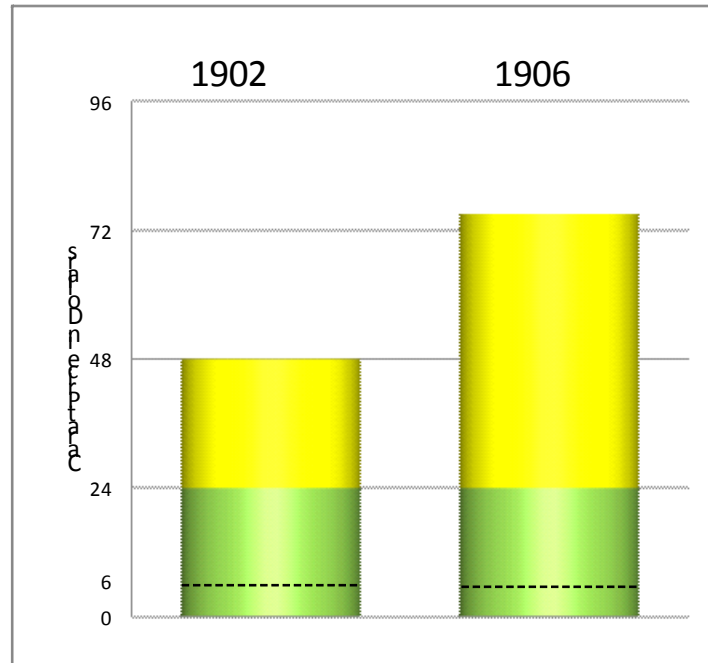
<sup>79</sup> *The Times*, 28 December 1909, p.58.

<sup>80</sup> 'Diamonds and Their Bearing upon the Future of Brazil', *Bulletin of the International Bureau of the American Republics* (February 1909), p.240.

<sup>81</sup> Day 1904, p.816

<sup>82</sup> Fowler Gillette Halbert, *Handbook of Rock Excavation Methods and Cost*, New York: Clark Book Company, 1916, p.329; also Mantell (1928), p.15.

<sup>83</sup> Hamilton (1915), p.221.



**Figure 7: Estimated revenues in the black diamond commodity chain**

Note: the vertical axis lists the price per carat along the chain. The green shaded area represents value earned by miner and claims owner in Brazil, while the yellow area represents value earned by subsequent intermediaries (Bahia exporter and New York importer)

A US Government report in 1907 noted that nearly all the diamonds found in Bahia, as well as the carbons, were sent to Paris. Yearly exports had risen steadily during 1890-1902, but had then fallen off. In 1902, some 2,500 carats a month (or 30,000 a year) of carbons was being produced in Bahia.<sup>84</sup> Vice-consul Rowe noted that the *carbonado* business:

Has been a monopoly in the hands of native firms, who have associated themselves with French and German Jewish firms in Paris and London.<sup>85</sup>

Yearly output of carbons from Brazil was estimated in 1906 at 30,000 carats, all of which went to Paris and thence to Amsterdam, other European cities and New York (about 10,000 carats being taken by the latter).<sup>86</sup> Oakenfull presented a rare estimate based upon Brazilian sources of Brazil's diamond exports in 1908-9 (see Table 2).<sup>87</sup> In value terms, carbons went mostly to the United States and brilliant diamonds to France and Britain.

<sup>84</sup> *Jewelers' Circular Newsletter*, 10 September 1902.

<sup>85</sup> Rowe (1908), p.146. Serre (1913, p.134) noted that carbon-diamond markets were located in Paris and London.

<sup>86</sup> US Department of the Interior, *Mineral Resources of the United States. Calendar Year 1906*, Washington DC: Government Printing Office, 1907, p.1222; and Goncalo de Athayde de Pereira, 'Memoria Historica e Descritiva de Sao Joao do Paraguassu', *Revista do Instituto Geographico e Historico da Bahia*, 9:30 (1904), p.132.

<sup>87</sup> J. C. Oakenfull, *Brazil in 1912*, London: Robert Atkinson, 1913, p.880.

**Table 2: Exports of Brazilian Diamonds from Bahia and Rio by Destination, 1908-9 (in %)**

Sources: Oakenfull (1913), p.880 and ‘Brazil’, *Bulletin of the Pan American Union* 31:1 (July-Dec.1910), p.55

To	Carbons, 1908	Diamonds 1908	Carbons, 1909	Diamonds, 1909	1909, all Diamonds
<b>Britain</b>	17.6	48.4	51.9	32.9	39.1
<b>France</b>	22.2	50.8	27.6	66.5	35.1
<b>USA</b>	60.1	~0	20.5	0.6	13.0
<b>Belgium</b>	-	0.6	-	-	0.1
<b>Germany</b>					12.2
<b>Total</b>	100.0%	100.0%	100.0%	100.0%	100%

Attempts by foreign companies to introduce large-scale methods of diamond recovery before 1925 had largely failed, with output still coming chiefly from small-scale hand workings.<sup>88</sup> Most of the attempts were made in the Minas Gerais region with some enterprises bringing in large dredges.<sup>89</sup> The Boa Vista Diamond Mine Co., Cascalho Syndicate Ltd., (est. 1914) and the Sopa Diamond Mine Ltd. were producing black diamonds.<sup>90</sup> The French, Companhia da Boa Vista Company, considered the first attempt to use modern methods to mine diamonds in Brazil.<sup>91</sup> The Boa Vista Co. was established in Paris in 1899, capitalised at 2 million francs (or \$400,000) to engage in diamond mining on claims it had acquired about eight miles from Diamantina. The operation was directed by the Cuban-American engineer, Antonio de Lavendeyra, with prior experience working on the Panama Canal.<sup>92</sup> The French firm built a water reservoir on a conglomerate-bearing plateau from which it piped out water needed for washing. It installed a power station whose dynamo was operated by a five hundred horsepower Pelton wheel, and electrical machinery was imported from the General Electric Co. (New York).<sup>93</sup> Though it used modern electric dredging equipment, it failed as the price of diamonds was too low and the system of utilising water pumped up from the stream was unsound.<sup>94</sup> Companhia da Boa Vista left the region prior to 1907.<sup>95</sup> In 1911, the Sopa Mining Co. British capital Sir Edmund Gabriel Davis,<sup>96</sup> was working a mine in the

<sup>88</sup> H. Foster Bain & T. H. Read, *Ores and Industry in South America*, New York: Council on Foreign Relations and Harper & Row, 1934, p.111.

<sup>89</sup> Pan American Union, ‘Diamonds and Their Bearing upon the Future of Brazil’, *Bulletin of the International Bureau of the American Republics* 28:2 (February 1909), pp. 249-55.

<sup>90</sup> George H. Kanz, ‘Brazil’, *The Mineral Industry*, 30 (1922), p.595.

<sup>91</sup> C. P. Bryan, ‘Diamond and Gold Mining in Minas Geraes’, *Monthly Consular and Trade Reports*, 60 (1899), p.542.

<sup>92</sup> *Jewelers’ Circular*, 17 May 1899.

<sup>93</sup> ‘Diamond and gold mining in Minas Geraes’, *Consular Reports. Commerce, Manufactures, Etc.* Vol. LX, Washington DC: Government Printing Office, 1899, pp.541-2.

<sup>94</sup> ‘Diamonds and Their Bearing upon the Future of Brazil’, *Bulletin of the International Bureau of the American Republics* (February 1909), p.252.

<sup>95</sup> Douglas B. Sterrett, ‘Precious Stones: Brazil’, in *Mineral Resources of the United States*, Washington DC: Department of the Interior, 1907, p.1221.

<sup>96</sup> Richard Peter Treadwell et al., *Glaxo: A History to 1962*, Cambridge University Press, 1992, p. 14. Sir Edmund Gabriel Davis was a base metals tycoon (dealing in, for example, Rhodesian copper and chrome, a financier called at the time ‘the Napoleon of finance’, promoter, and major investor abroad with holdings spanning the globe. He served as chairman of the Sopa Diamond Co. and had ties with another prominent Jewish mining pioneer, Sir Ernest Oppenheimer who would gain control of the De Beers group in the early 1920’s. Davis and Oppenheimer cooperated in mining ventures, in West and South African, Angolan, and Congolese diamonds (M. Aynan Ehrlich, *Encyclopedia of the Jewish Diaspora, Experiences and Culture*, Santa Barbara and London: ABC-CLIO LLC, 2009. P. 517).

small village of Sopa, some fifteen kilometres from the famed diamond mining town of Diamantina. However, due to an inability to produce a profit, the Sopa Company was liquidated in October 1915.<sup>97</sup> The company had spent £250,000 trying to introduce mechanised mining. It failed and the expensive machinery was sold in 1915 at a great loss. Later, British interests provided \$1 million to further modernise methods in the Boa Vista mine (sometime during 1900-1915) and French money was invested in Sopa. But by 1922, the Boa Vista Diamond Mine Co. and Sopa were both owned primarily by Brazilian capital (though British interests owned 20 per cent of the Boa Vista). The British controlled the Cascalho Syndicate,<sup>98</sup> which owned over 13 million square meters of freehold land on and around the Rio Jequinhona, whose purpose appeared to have been mechanised dredging for diamonds.<sup>99</sup> In 1922, three mines (not companies) – Boa Vista, Cascalho and Sopa – were under negotiation for purchase by North American capital, but it does not appear these efforts were successful.<sup>100</sup>

At the turn of the century, a German publication noted the following enterprises involved in exploring and/or extracting diamonds in Minas Gerais: the Companhia Boa Vista with French, Belgian and Brazilian capital operating fifteen kilometres from the township of Diamantina and using electrical machinery; Victor Nothman and Co. mining the Rio Abaete; the Agua Suja Mining Co. with British and German capital to the amount of £210,000 operating in the Bagagem region; the Brazilian Diamond and Gold Explorations Company Ltd. (London) established in 1902 with a capital of £225,000; and the Brazilian Diamond, Gold and Developing Company (Chicago) with North American capital. The German Jewish businessman of Sao Paulo (with interests in a brewery and luxury-class housing development in Sao Paulo), Victor Nothman, had obtained the diamond concession on the Rio Abaete in 1903. The Abaete region had been heavily worked during 1785-1807.<sup>101</sup>

In Bahia, a little machinery was in use in 1906, consisting of a few pumps, a gravel sorter and a so-called automatic separator at the Salobro mines. Miguel de Teive e Argollo had brought in some electrical equipment around 1898 for diamond mining in Andarahy. The only other machinery consisted of a few electro-hydraulic pumps operated since 1907 by an English company on the Sao Jose do Paraguassu River.<sup>102</sup> In 1902, the Brazilian Diamond Field Corporation Ltd. had been formed to explore for diamonds in Bahia. A British syndicate bought lands where the large Sergio carbon diamond had been found in 1895. The venture was called the S. Jose Diamond and Carbon C. Ltd. and it was managed by a British engineer, Jayme Thomas Richards.<sup>103</sup> Pereira reported in 1905-7 that two foreign companies were exploring for carbons in the riverbed of the Paraguassu employing modern machinery.<sup>104</sup> But the US consul in Rio, George Anderson, was warning potential investors in the United States in 1906 that ignorant promoters were attempting to sell stocks in gold and diamond mining companies in Brazil.<sup>105</sup> Around 1909, a very large riverboat dredge was operating.<sup>106</sup> The

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<sup>97</sup> Thomas Arthur Rickard, in *The Mining Magazine*, 10 (1914), p.398 and *The London Gazette*, 8 October 1915.

<sup>98</sup> Benjamin LeRoy Miller & Joseph Theophilus Singewald, *The Mineral Deposits of South America*, New York: McGraw-Hill, 1919, pp.208-10.

<sup>99</sup> *The Times*, 27 April 1920.

<sup>100</sup> Kanz (1922), p.595.

<sup>101</sup> Julio Pompeu, *Vier Staaten Brasilien*, Rio de Janeiro: TypographiaLeuzinger, 1910, p.24.

<sup>102</sup> Furniss (1906), p.280.

<sup>103</sup> Goncalo de Athayde Pereira, *Memoria historica e descriptiva do Municipio does Lencoes (Lavras Diamantinas)*, Salvador: Officinas da Empresa 'A Bahia,' 1910, p.20 and *Memoria historica e descriptive de Sao Joao do Paraguassu*, Salvador: Litho-typ e encadernacao Reis & C, 1907, p.24.

<sup>104</sup> Pereira (1907), pp.29-30 and (1905), p.140.

<sup>105</sup> *New York Times*, 16 July 1906, p.4.

French Sao Jose [Brazil] Diamonds and Carbons Ltd. was formed in 1903, chaired by the Frenchman Arthur Lodin, to acquire nine concessions from the Anglo-Brazilian Diamond Syndicate, around the Sao Jose River (near Lencois) in Bahia and lease lands elsewhere for half a million dollars.<sup>107</sup> The British mining engineer Arthur Robert Turney was resident engineer in Lencois. A hydroelectric unit was built, but in 1911 the company was liquidated in 1912. Subsequently, two Brazilian companies – the old Boa Vista firm and the Sopa enterprise – operated in the area with some success. In 1910, the Paris-based firm of M. Ulmann e Cia, located in the Lower City at Rua das Princezas 12, capitalised at 1 million French francs, was registered by the Ulmann interests with the *Junta Comercial* to deal in diamonds, *carbonados* and rare stones.<sup>108</sup>

### **The Great War and entry of North American monopoly capital**

For the last two decades of the nineteenth century, Bahia's black diamond exports to the United States were in the hands of the Simon Dessau enterprise (headed by David S. Dessau and then his son, Simon). During the early twentieth century, another Jew, Arthur Bandler, would dominate the sale of black diamonds in the United States until the Great Depression. Dessau was a German Jewish immigrant born in Hamburg who arrived in New York in 1870, going to work in the diamond business in 1874.<sup>109</sup>

Simon soon started his own importing enterprise specialising in industrial diamonds (*carbonado* and *bort*). Dessau had secured a contract with the Brazilian government in the late 1870s that covered the entire output of South America's largest carbon mines located in Bahia.<sup>110</sup> He earned the label 'Carbon King', whose specialty was selling imported black diamonds for use in drilling and making diamond tools, though he also dealt in *borts* and even in white diamonds. An advertisement in 1880 by the Dessau Co. of New York promoted its black diamonds for cutting cemetery millstones, grinding stones of emery as well as for use in diamond lathe tools. In 1884, the largest diamond ever cut in the United States was purchased by Simon Dessau. The stone had been mined in South Africa in 1873 and immediately acquired by the London De Beers syndicate.<sup>111</sup> Eleven years later, the syndicate sold the stone to Dessau. It weighed 78 carats uncut. Mr Dessau cut the stone into 128 facets and showed it at the 1884 New Orleans Exposition. Shortly afterwards it was bought by the British actress, Miene Schönberg Marx (alias Minnie Palmer) of Marx Brothers' fame, for \$40,000.<sup>112</sup> The stone came to be known as the 'Cleveland Gem' after the US president.

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<sup>106</sup> 'Diamonds and Their Bearing upon the Future of Brazil', *Bulletin of the International Bureau of the American Republics* (February 1909), p.253.

<sup>107</sup> J. P. Wileman, *The Brazilian Year Book second issue – 1909*, Rio de Janeiro & London: Messrs. McCorquodale & Co. Ltd., 1909.

<sup>108</sup> Owned by Mathias Ulmann, Charles Ulmann, and Isidore Ulmann (CPE, *A Insercao da Bahia na Evolucao Nacional 2a Etapa: 1890-1930* (1980), p.75). The Ulmann firm is listed in Oakenfull (1913), p.878.

<sup>109</sup> Daniel E. Russell, 'The Cleveland Diamond: Mugwumps, Madness, Marital Mayhem and Mystery', *Mindat.org* (last updated 20 November 2008) at <http://www.mindat.org/article.php/465/The+Mystery+of+the+Cleveland+Diamond>; and 'David S. Dessau Dies in Europe as He Starts for Home', *The Jewelers' Circular*, 30 September 1891, p.28.

<sup>110</sup> *New York Times*, 6 February 1894.

<sup>111</sup> *New York Times*, 23 November 1884.

<sup>112</sup> Russell (2008).

Following twenty years in the diamond business, in 1894 the Simon Dessau enterprise came upon hard times even though Mr Dessau was reputedly worth \$350,000 in 1893 dollars (or \$8.6 million in 2009). Dessau had diversified into iron mining in Michigan and held large blocks of New York real estate on Broadway and elsewhere. Dessau was well-known in New York high society where he entertained and attended horse races (in which he admitted he had lost hundreds of thousands of dollars betting). After some years of lean times, the Dessau firm revived under the leadership of Maurice S. Dessau with a focus upon diamond tools and was active in the New York carbons trade during the 1920s.<sup>113</sup> Up until the First World War, the English diamond merchants, De Beers syndicate, controlled the world market in black diamonds. However, the Great War severed connections between the diamond fields of Bahia and Europe; and both during the war and after, American firms sent agents to Bahia to explore purchasing diamonds.<sup>114</sup> Bahia exported 11,803 carats of rough gemstone diamonds and 3,714 carats of *carbonados* to the United States in 1915. Most of these diamonds were half a carat or less and the average price at which they were invoiced at the Bahia US consulate was \$18 per carat for a gemstone and \$32 for *carbonados*.<sup>115</sup> The Diamond Drill Carbon Co. (set up in New York in 1888) was importing Brazilian carbons using the Brazilian Lloyd steamship service. During 1913-18, the annual value of uncut diamonds imported into the United States remained in the \$12-14 million range with Britain being the major supplier (70 to 87 per cent);<sup>116</sup> but Brazil's share rose from a paltry \$20,000 in 1913 to \$1,194,000 in 1918.<sup>117</sup>

US diamond imports from Brazil increased five-fold during the war and amounted to 85 per cent of Brazil's mine output.<sup>118</sup> This shift was part of the major shift during the First World War when the United States began replacing Britain in Brazil.<sup>119</sup> About two-thirds of the imported diamonds came in rough form to New York, which propelled the city to overtake Amsterdam and Antwerp as cutting centres. Advertisements in a prominent trade journal of 1901, mentioned suppliers of carbons in New York: S. Dessau, I.C. Yawger, Theodor Lexow and Bernard Bandler.<sup>120</sup>

In 1919, over 50 percent of all diamonds and carbons exported from Bahia went to the United States, 40 percent to England and the remainder to the Netherlands.<sup>121</sup> Official export values of Bahian *carbonados* were put at 2,423 contos (\$329,528) in 1919; 3,017 contos (\$410,312) in 1920; and 2,616 contos in 1921 (\$355,776).<sup>122</sup> US Consul Bevan noted that both during and after the Great War, several American firms sent agents to explore the purchase of diamonds. However, diamond exports including brilliant and black stones from Bahia in 1920 as recorded by the Salvador custom house totalled \$1,360,571, of which about

<sup>113</sup> *New York Times*, 7 February 1894 and 20 May 1896.

<sup>114</sup> Reed, (1930), pp.289-93.

<sup>115</sup> G.A. Roush (ed.), 'Brazil', in *Mineral Industry Its Statistics, Technology and Trade During 1915* Vol. 24, New York: McGraw Hill, 1916, p.606, based upon Fraser, (1916), p.675.

<sup>116</sup> 'The Diamond Trade,' *Commerce Monthly: A Journal of Commerce and Finance* 3:8 (1921), p. 24.

<sup>117</sup> *Jewelers' Circular*, 6 August 1919.

<sup>118</sup> Jackson (1919), p.140.

<sup>119</sup> Emily S. Rosenberg, 'Anglo-American Economic Rivalry in Brazil during World War I', *Diplomatic History* 2:7 (April 1978), pp. 131-52.

<sup>120</sup> *Mines and Minerals* 24:12 (July 1901), p. 28.

<sup>121</sup> Thomas H. Bevan, 'Brazil. Bahia', *Supplements to Commerce Reports. Review of Industrial and Trade Conditions in Foreign Countries in 1919 by American Consular Officers*, Washington DC: Bureau of Foreign and Domestic Commerce, Department of Commerce, 1921a, p.5.

<sup>122</sup> G. A. Roush (ed.), *The Mineral Industry Its Statistics, Technology and Trade during 1921*, Vol. XXX, New York: McGraw-Hill, 1922, p.595.

65 per cent went to the United States.<sup>123</sup> In 1927, Bahia exported 24,578 carats of black diamonds valued at over \$1.5 million.<sup>124</sup> In 1928, a troy ounce of gold was worth \$20.67, a troy ounce of platinum was \$70, and a troy ounce of black diamonds brought from \$3,800 to \$22,275.<sup>125</sup> Bandler reported in 1928 that the best grade of black diamonds was bringing \$165 a carat.<sup>126</sup>

Around 1900, a North America firm owned by the Austrian Jewish immigrant Bandler family set up a buying branch in New York and twenty years later established a large mining operation in Bahia.<sup>127</sup> During the 1920s, Bahia's black diamond trade fell into the hands of the Bandlers, when in 1924 Arthur Bandler of New York showed up in Bahia, pockets full of cash and determined to break European control of the world trade in black diamonds.<sup>128</sup> The Bahia Corporation was formed by the Bandlers in June 1927, with an issuance of 60,000 shares of \$25 each as a holding company for Bernard Bandler and Sons Inc. and the Cia. Brasileira de Exploracao Diamantina.<sup>129</sup> This move was part of a larger-scale entry of North American capital into Bahia during the interwar years.<sup>130</sup> Bahia Corp. secured a virtual monopoly on the black diamond fields of Bahia, having in 1927:

obtained a thirty-year concession from the Bahia Government, transported mining equipment by burro and canoe, built a hospital, school, and modern road, engaged 1,400 natives...<sup>131</sup>

Thanks to this connection, Bandler's firm owned and operated mine properties in the Piranhas district of Andarahy, Bahia, reportedly valued at \$50 million.<sup>132</sup> His company held 14½ square miles of proven territory along the Paraguassu River (Figure 6).<sup>133</sup> Bandler hired the experienced North American mining engineer, A. D. Hughes, to serve as general operations manager in Bahia. He also employed two other mining engineers, Alexander P. Roger of New York and in Bahia, Maximo Macambyra Monte-Flores who had extensive experience in the geology of the state. Heavy equipment was shipped over including slack line cableways, a trammel, concentrating tables, Worthington pumps, a steam boiler, a Westinghouse turbo-generator and Allis-Chalmers' ball mills.<sup>134</sup> The production involved stripping the overburden to get to the diamond-bearing gravels some 20 feet below.<sup>135</sup> The gravel was then dug out by native workers and carried on their heads to the cars of the electric

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<sup>123</sup> Consul Thomas H. Bevan, 'Review of Bahia Export Trade for 1920', *Commerce Reports*, Vol. 3, Washington: Bureau of Foreign and Domestic Commerce, 1921, pp. 408-9.

<sup>124</sup> If the sales price in New York was \$100 per carat and the freight, insurance and mark up in New York accounted for \$25. Consul Bevan (1921b, p.409) had reported that in 1920 the price of a superior carbon was \$55-60 per carat.

<sup>125</sup> Orville H. Kneen, 'Gems That Work for a Living: Black Diamonds, the Most Precious Stones on Earth, Put to Industrial Uses', *Popular Science Monthly*, 112:1 (January 1928), p.133.

<sup>126</sup> *New York Times*, 2 May 1928, p.30

<sup>127</sup> The firm of Bernard Bandler & Sons, founded by Arthur Bandler's father, had dealt in black diamonds since 1896. Bernard Bandler had once said that he had crushed more than \$15 million worth of them with a machine in his Fortieth Street Office in New York.

<sup>128</sup> 'The King of the Black Diamonds', *Popular Mechanics Magazine*, 56:6 (December 1931), pp.984-7.

<sup>129</sup> *New York Times*, 3 June 1927, p.30.

<sup>130</sup> Marc W. Herold, 'Entre o Acucar e o Petroleo: Bahia e Salvador, 1920-1960', *Revista Espaco Academico*, 42 (November 2004).

<sup>131</sup> *New York Times*, 29 December 1932, p.19.

<sup>132</sup> *New York Times*, 18 May 1927, p.35.

<sup>133</sup> *Moody's Industrials Manual 1935*, p.2368. The Bandler mining venture is described in Reed (1930), pp.289-293.

<sup>134</sup> Reed (1930), p.292.

<sup>135</sup> W.B. Stanley & Burton E. Anderson (July 1932), p. 313

railroad for delivery to the company's mill. The Bahia mining operation employed 1,400 workers (Figure 8). The investment represented the first time in the history of black diamond mining that operations were carried on in a modern manner.<sup>136</sup>

In 1930, Bahia's black diamonds were being used to bore for iron in the Mesabi Range, in exploration work for the Chicago subway system, to test drill at the Hoover dam, exploring for copper in Russia's Ural Mountains, and in Nevada gold prospecting.<sup>137</sup> Bahia supplied almost all of the world's black or industrial diamonds used in industrial grinding, cutting and polishing.<sup>138</sup> The largest US consumer of industrial diamonds, about 30 percent of the demand, was the auto industry because of the extensive use of emery wheels in the production process. Emery was used to finish and smooth the auto bodies along with other tasks.<sup>139</sup> Eight cents worth of diamonds were used to produce the average auto. Aside from 20 percent being used for drilling, another 20 percent were used in drawing copper wire, 20 percent for the production of billiard balls, telephones and pens, and a few diamonds were used in high-pressure furnaces.<sup>140</sup> Bandler's customers read like a *Who's Who* of the American mining industry and Bandler had earned the title "King of the Black Diamonds".<sup>141</sup>

Bandler was not without competitors in the New York market for imported carbons. Competition came from the Jewish firms of J. Baszanger and Co., S. Dessau's Sons of Simon Dessau and the Dessau Diamond Tool Co., Theodore Lexow, and Henry Demmert and Company (of Henry Demmert who originally worked for S. Dessau) and I. C. Yawger; all of whom operated out of New York importing black diamonds.<sup>142</sup> Demmert later became a director of Lexow's company along with running his own.<sup>143</sup> The Baszanger enterprise owned by the Amsterdam Jew, Jacques Baszanger (born in Amsterdam, 1870, who then moved to Paris to become a diamond merchant), bought the famous Sergio black diamond weighing 3,078 carats or 630 grams) from Bahia and had it broken up into pieces used for diamond drills. Baszanger maintained offices in the world's three largest diamond centres: London, New York and Paris. It appears all, except Bandler after his Bahia purchase, only engaged in the wholesale selling of the imported carbons.

In 1928, the US market for *carbonados* was strong enough that despite the Bandler mining operation in Bahia not yet in full operation, the company's retail branch in New York generated sufficient cash flow to pay dividends on The Bahia Corporation's equity.<sup>144</sup> Although Bandler's concession gave him a virtual monopoly on the black diamond fields of Bahia, shares of Bahia Corporation were delisted on 1 September 1931.<sup>145</sup> Bahia Corporation's stock price fell as low as \$1.33 in 1931, and the price when the firm was delisted was \$3.50. Bandler suggested enigmatically in the *New York Times* a day later that it was a "Western concern" involved in the sale of Bahia's stock that caused it to be delisted.<sup>146</sup> Bahia Corporation was not mentioned again in the *New York Times* until the death of Arthur Bandler

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<sup>136</sup> D. M. Anderson, 'Mining Black Diamonds in Brazil', *Compressed Air Magazine* (August 1933), p.4195.

<sup>137</sup> 'The King of the Black Diamonds', *Popular Mechanics Magazine*, 56:6 (December 1931), pp.985-6

<sup>138</sup> 'Americans in Brazil', *Fortune* (November 1931), p.92.

<sup>139</sup> Joyce Shaw Peterson, *American automobile workers, 1900-1933*, Albany: SUNY Press, 1987, p.37.

<sup>140</sup> 'Diamonds Help Make Your Car and Fire Your Furnace', *Popular Mechanics* (December 1935), p.140A.

<sup>141</sup> 'The King of the Black Diamonds', *Popular Mechanics Magazine*, 56:6 (December 1931), pp.984-7.

<sup>142</sup> *Mines and Minerals*, July 1901, p.48 and 'Companies and Advertisements', *Mining World*, 1 January 1910:1.

<sup>143</sup> *Colliery Engineer* Vol. 22 (February 1902), p.312.

<sup>144</sup> *The Pittsburgh Press*, 10 May 1928

<sup>145</sup> *New York Times*, 1 September 1931

<sup>146</sup> *New York Times*, 2 September 1931



in 1932.<sup>147</sup> Bandler's operations on the Paraguassu continued into 1933.<sup>148</sup> Thereafter *carbonados* were still mined in the Piranhas region but not in any organised manner. Nonetheless, output was significant, with Brazil exporting 330,000 carats of diamonds in 1941 of which 70 per cent were industrial ones.<sup>149</sup>



**Figure 8: Bandler's Mine and Processing Plant of The Bahia Corporation**

Source: Stanley and Anderson (1932), p.314

By 1934, the high price of black diamonds had pushed drillers to experiment with cheaper diamonds and other substitutes.<sup>150</sup> As late as 1921, the only other country with any known carbon deposits of consequence was Borneo.<sup>151</sup> Black diamonds were also discovered in North Carolina, but not in significant quantities.<sup>152</sup> Metallic competitors became available and challenged the dominance of black diamonds for drilling. For instance, already in 1921 tungsten carbide was thought to be able to “replace the diamond entirely for all industrial purposes where the variety of this precious stone, known as *bort*, is used”.<sup>153</sup> In the early 1930s, a scientist at Columbia University had artificially created diamonds using the new electrical furnace and the tremendous pressure it allowed. These factors led to the demise of Bandler and others in the pre-Second World War years.

<sup>147</sup> *New York Times*, 29 December 1932

<sup>148</sup> D. M. Anderson, ‘Mining Black Diamonds in Brazil’, *Compressed Air Magazine* (August 1933), pp.4195-8.

<sup>149</sup> Ministerio das Relacoes Exteriores, *Brazil 1943*, Rio de Janeiro: Ministerio das Relacoes Exteriores, 1944, p.118.

<sup>150</sup> Bain & Read (1934), pp.110-11.

<sup>151</sup> ‘The Diamond Trade’, *Commerce Monthly: a Journal of Commerce and Finance*, 3:8 (1921), p.22.

<sup>152</sup> ‘Diamond Mines in Arkansas Produce Rare Gems’, *Popular Science* Vol. 51 (May 1929), p.711.

<sup>153</sup> Hugo Lohmann, ‘Molten Tungsten: New Developments in the Manufacture of Tungsten and Its Compounds’, *Scientific American Monthly* (1921), p.4.

The production of *carbonados* in Brazil approximated the exports of the state of Bahia as it was the only producing zone in Brazil. The increased role of Rio after 1937 (Table 3) was no doubt due to the Axis powers – Germany and Italy – smuggling such strategically valuable industrial inputs out on the Italian LATI airline’s bi-monthly flights (beginning in December 1939 and operating until December 1941) between Rio and Rome.<sup>154</sup> The unorganised and erratic Brazilian source of diamonds was utterly insufficient to supply the emerging large Axis and Allied armies of the late 1930s. As a Soviet diamond expert noted, “big production of up-to-date arms requires long-term hard-and-fast planning of supplies of required materials, but practice of production of diamonds in Brazil has not met this requirement whatsoever”.<sup>155</sup>

**Table 3: Diamond Exports of Bahia (in grams)**

Source: Ministerio de Relaciones Exteriores, Instituto Brasileiro de Geografia e Estatística, *Brasil*, Rio de Janeiro: IBGE, 1940, p.258

Year	Total exports	To Rio de Janeiro (%)	To Overseas (%)
1937	2,605 (g)	12.7	87.3
1938	1,370	31.0	69.0
1939	3,163	70.0	30.0

Before the war, most diamond mines in Africa were closed as a result of the depressed world economy, and hence Brazil was an important source of supply.<sup>156</sup> De Beers controlled the world supply of industrial diamonds. Obtaining these industrial diamonds became critical for both the United States and Germany. With the coming of war, the demand for industrial diamonds far outstripped Brazilian supply and the industrial countries turned to Africa: another instance of where colonies existed to buttress the economies of the metropole in time of war.<sup>157</sup> Roosevelt’s war planners estimated that the US needed at least 6.5 million carats of industrial diamonds to convert its factories to war production.<sup>158</sup> Industrial diamonds were needed for cutting steel, making ball bearings, drawing the wire needed for weapons. Aircraft engines, gyroscopes, electronic parts, torpedoes, tanks and artillery depended upon production processes employing industrial diamonds. Germany turned to De Beers, which managed the Belgian mines in the Congo. Millions of carats of industrial diamonds from its Forminier mine (Belgian Congo) were smuggled via Tangier and Cairo in Belgian Red Cross parcels to Switzerland and then on into German-occupied Belgium.<sup>159</sup> Fiction has it that by 1943, the

<sup>154</sup> Melvin Hall & Walter Peck, ‘Wings for the Trojan Horse’, *Foreign Affairs* 19, 2 January 1941, pp. 366-68; Donald H. Dunn, *Ponzi: the Incredible True Story of the King of Financial Cons*, New York: Random House, 1975, p.346. A thorough analysis of the LATI flights to South America is provided by Roberto Gentili, ‘Pioneering on the South Atlantic, Italian Style’, *Putnam Aeronautical Review*, 8 (December 1990), pp.232-243.

<sup>155</sup> Vladimir Malakhov, ‘Diamonds of the Third Reich and Some Specific Features of Managing Global Raw Materials Markets. Part 2’, *Rough and Polished.com* (May 2, 2008) at [http://www.rough-polished.com/en/analytics/14346.html?phrase\\_id=317332](http://www.rough-polished.com/en/analytics/14346.html?phrase_id=317332).

<sup>156</sup> C. W. Wright, ‘South America as a Source of Strategic Minerals’, *Mining and Metallurgy*, 21 (1940), pp.283-6.

<sup>157</sup> Raymond Dumett, ‘Africa’s Strategic Minerals during the Second World War,’ *Journal of African History* 26, 4 (October 1985), pp. 361-408.

<sup>158</sup> John F. Hanley, ‘Diamonds’, at <http://www.johnfhanley.co.uk/#/diamonds/4568093041>.

<sup>159</sup> Laurie Flynn, ‘Frontline: The Diamond Empire’, *PBS.org* (1 February 1994) at <http://www.pbs.org/wgbh/pages/frontline/programs/transcripts/1209.html>, p.10.

Axis powers had worn out the smuggled Brazilian industrial diamonds and were converting diamond gemstones into tool parts.<sup>160</sup> Reality was otherwise as described by a Soviet analyst,

From their secret service agents penetrated into the Third Reich military-industrial complex management structures Americans came to know that in November 1943 Germany had obtained diamonds in volumes sufficient for 8-month operation of its Defence Industry. A source of this huge delivery was established – Belgian Congo. This country was governed by the Government-in-exile – in London. Mining at the Congo deposits was performed by Forminier Company and completely controlled by De Beers.<sup>161</sup>

The Congo's diamonds also made their way to Allied armies – e.g. African diamonds supplied 90 percent of Allied needs at the time.<sup>162</sup> The De Beers cartel supplied more than 85 per cent of US industrial diamonds during 1940-45.<sup>163</sup>

Wartime had led to a surge in the search for and use of industrial diamonds in the steel industries. US consumption of black diamonds increased dramatically during the Second World War spurred by the demand for metal cutting with imports nearly quadrupling from 3,568,730 carats in 1939 to 12,172,679 carats in 1943. Over 90 per cent of industrial diamond consumption in 1944 went to grinding wheels and drilling applications, the remainder to polishing.<sup>164</sup> In 1942, the output of diamond tools in the United States required more than a ton of industrial diamonds, equal to the cost of several battleships.<sup>165</sup>

## Conclusion

This research complements a small body of existing literature that examines commodities in Bahia as complex chains of interfaces: Bert Barickman's classic study explored sugar, tobacco, cassava and slavery in the Bahian Reconcavo during 1760-1860; Jane Collins' examination of the more recent grape commodity chain; Mary Ann Mahoney has analysed the global and local factors in the emergence of Bahia's cacao-export sector; and Marc Herold has assessed the sugar-machinery chain in the context of Bahia's sugar crisis (1875-1914).<sup>166</sup> But the diamond trade of Bahia has been largely ignored in the academic literature, especially when compared to the extensive writings devoted to tobacco, cocoa, coffee and sugar in the

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<sup>160</sup> 'Diamonds in Overalls', *Popular Mechanics* 80:4 (October 1943), pp.34-8.

<sup>161</sup> Malakhov (2008).

<sup>162</sup> Janine Roberts, 'Without Congo's Diamonds, World War II Could Not Have Been Won', *New African*, No. 444 (October 2005).

<sup>163</sup> *New York Times*, 11 February 1994

<sup>164</sup> Ruth C. Leslie, 'Diamonds as Tools Speed up Victory', *Journal of Chemical Education*, 22:10 (1945), p.513.

<sup>165</sup> Robert F. Smith, 'Diamonds by the Ton, Make Tools to Grind the Axis', *Popular Science Monthly*, 143:2 (August 1943), pp.106-7.

<sup>166</sup> B. J. Barickman, *A Bahian Counterpoint. Sugar, Tobacco, Cassava, and Slavery in the Reconcavo, 1780-1860*, Stanford: Stanford University Press, 1998; Jane L. Collins, 'Tracing Social Relations in Commodity Chains: The Case of Grapes in Brazil', in Angelique Haugerud et al. (eds), *Commodities and Globalization. Anthropological Perspectives*, Oxford: Rowman & Littlefield, 2000, pp.97-112; Mary Ann Mahoney, 'The Local and the Global: Internal and External Factors in the Development of Bahia's Cacao Sector,' in Steven Topik et al. (eds), *Commodity Chains and the Building of the World Economy, 1500-2000*, Chapel Hill: Duke University Press, 2007, pp.204-27; and Marc W. Herold, 'The Import of European Sugar Machinery to Offset the Sugar Crisis in Bahia, 1875-1914', *Revista Ciencias Administrativas*, 15:1 (January/June 2009), pp.11-37.

Bahian economy.<sup>167</sup> Only recently has commodity-chain analysis been applied to diamonds, in the case of Africa's 'resource wars'.<sup>168</sup>

The study uncovers and demonstrates another example of the role of Jewish traders in the international commerce of Brazil and its commodity chains during the late nineteenth-century.<sup>169</sup> The Jewish diamond merchants of Bahia paralleled the strong presence of Jewish traders in the Amazon rubber-export boom and the Jewish traffickers of Polish-Jewish prostitutes (*polacas*) from Europe to South America during 1867-1939.<sup>170</sup> Imports of black diamonds into New York (and thereby the US) during 1880-1932 were in the hands of two towering Jewish merchants, Simon Dessau and Arthur Bandler.

The emergence of a new engineering technology (the Leschot rock drill) had powerful feedback effects upon Bahia's diamond industry at precisely the time when its traditional white diamond exports were dwindling. *Carbonados* (black diamonds) gave Bahia's diamond industry another half-century of life. At the base of the wealth pyramid, the *garimpero* toiled – diving in rivers, panning in streams, cracking mountainside walls with rudimentary hand tools, living a hard life whose fate was determined by the lottery of stones.<sup>171</sup> European capital could not establish a long-term successful diamond-mining venture in Minas Gerais, and later American capital could not operate a flourishing source of black diamonds in Bahia. Contrary to assertions in much of dependency theorising, one-half to two-thirds of the market value of the *carbonado* commodity chain remained in Bahia (Figure 7). The locally-retained value of the diamond commodity chain was far greater than has generally been assumed or proclaimed,<sup>172</sup> which is not to say that the monetary surpluses were productively employed. Vilmar Faria attributed Salvador's spasms of industrialisation to the shifting availability of local resources, which I argue was less the issue than how the available local resources were employed – that is, to further capital accumulation or to sustain a consumption boom.<sup>173</sup> Half a century ago, economists like Paul Baran and Celso Furtado

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<sup>167</sup> For example, diamonds earn only brief mention in a footnote in the only attempt to assess Bahia's exports during the Old Republic (Istvan Jansco, 'As exportacoes da Bahia durante a Republica Velha 1889-1930', in 'L'histoire quantitative du Bresil de 1800 a 1930', *Colloques Internationaux du C.R.N.S.*, 543 (1973), pp.335-39). In his history of the diamond, Crider makes no mention of Bahia ('The Story of the Diamond', *American Midland Naturalist*, 9:4 (July 1924), pp.176-191). A rare exception is Carneiro (1908). Very brief mention of Bahia's diamonds is made in Godehard Lenzen, *The History of Diamond Production and the Diamond Trade*, New York: Praeger Publishers, 1970, p.131; while the Brazilian diamond during 1750-1830 with a focus upon the role of diamonds in banking is examined in Harry Bernstein, *The Brazilian Diamond in Contracts, Contraband and Capital*, Lanham: University Press of America, 1986.

<sup>168</sup> See Philippe Le Billon, 'Scales, Chains and Commodities: Mapping Out "Resource Wars"', *Geopolitics*, 12:1 (February 2007), pp.200-5 and 'Diamond Wars? Conflict Diamonds and Geographies of Resource Wars', *Annals of the Association of American Geographers*, 98:2 (2008), pp.345-72

<sup>169</sup> A fascinating case study of Jewish dominance in another luxury commodity chain, ostrich feathers, is analysed in Sarah Abrevaya Stein, "'Falling into Feathers": Jews and the Trans-Atlantic Feather Trade', *Journal of Modern History*, 79 (December 2007), pp.772-812.

<sup>170</sup> Marc W. Herold, 'Consumer Society in the Baroque Pearl of the Jungle: Manaus, 1890-1912', conference paper, New England Council for Latin American Studies (NECLAS), University of Connecticut at Storrs, 2010; Edward Bristow, *Prostitution and Prejudice: The Jewish Fight against White Slavery 1870-1939*, New York: Schocken Books, 1983.

<sup>171</sup> This material reality in which luck played such a role had important cultural dimensions, explored for example in Ronaldo de Salles Senna & Itamar Aguiar, 'Jare: Instalacao Africana na Chapada Diamantina', *Afro-Asia* No. 13 (1980): 76-85 at [http://www.afroasia.ufba.br/pdf/afroasia\\_n13\\_p75.pdf](http://www.afroasia.ufba.br/pdf/afroasia_n13_p75.pdf).

<sup>172</sup> As in Consuelo Sampaio, 'Crisis in the Brazilian Oligarchical System: A Case Study of Bahia', 1889-1937, Champaign Urbana, University of Illinois, 1979, pp. 6-7.

<sup>173</sup> Vilmar E. Faria, 'Divisao Inter-Regional do Trabalho e Pobreza Urbana: A Caso de Salvador', in Guaraci Adeodato et al. (eds), *Bahia de Todos os Pobres*, Petropolis: Vozes e Caderno CEBRAP no. 34, 1980, p.32.

emphasised that the form of utilisation of a country's economic surplus was key to understanding development.<sup>174</sup> In Bahia, the surplus was spent on lavish consumption, lands and real estate.

During the sixty years of Bahia's *carbonado* cycle, the changing organisation and nature of Bahia's diamond commodity chain has been analysed:

**Table 4: Salient Features of the 60-year Carbonado Cycle**

	1860s – 1880s	1920s
<b>Labour organisation</b>	Slave labour, individuals or share contracts	Share contracts or wage labour
<b>transportation</b>	Mule caravan and steamship	Railway and steamships
<b>Primary destinations</b>	Paris, London (secondary to Amsterdam or Antwerp)	New York
<b>Predominant diamond type</b>	Gemstones for jewellery and fashion	<i>Carbonados</i> for industry

What had begun entirely by chance in 1843 when a Frenchman bought some odd-looking stones in the Chapada Mountains, grew when such stones were revealed to be extremely hard. With these becoming sought after in Europe for polishing and grinding, and then for cutting/drilling with the invention of the diamond-crown Leschot drill, a complex commodity chain evolved in which one-third to one-half of the final value of a black diamond remained in Bahia (Figure 7). Bahia's carbonados became vital for constructing the modern city with tall buildings and subways, for building public infrastructure and for waging modern war in the twentieth century.

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<sup>174</sup> Paul Baran, *The Political Economy of Growth*, New York: Monthly Review Press, 1957; and Celso Furtado, *A Fantasia Organizada*, Rio de Janeiro: Paz e Terra, 1985

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**Commodities of Empire** is a joint research collaboration between the Open University's **Ferguson Centre for African and Asian Studies** and the **Institute of the Americas, UCL**. These two institutions form the nucleus of a growing international network of researchers and research centres.

The mutually reinforcing relationship between 'commodities' and 'empires' has long been recognised. Over the last six centuries the quest for profits has driven imperial expansion, with the global trade in commodities fuelling the ongoing industrial revolution. These 'commodities of empire', which became transnationally mobilised in ever larger quantities, included foodstuffs (wheat, rice, bananas); industrial crops (cotton, rubber, linseed and palm oils); stimulants (sugar, tea, coffee, cocoa, tobacco and opium); and ores (tin, copper, gold, diamonds). Their expanded production and global movements brought vast spatial, social, economic and cultural changes to both metropolises and colonies.

In the Commodities of Empire project we explore the networks through which such commodities circulated within, and in the spaces between, empires. We are particularly attentive to local processes – originating in Africa, Asia, the Caribbean and Latin America – which significantly influenced the outcome of the encounter between the world economy and regional societies, doing so through a comparative approach that explores the experiences of peoples subjected to different imperial hegemonies.

The following key research questions inform the work of project:

- 1) The networks through which commodities were produced and circulated within, between and beyond empires;
- 2) The interlinking 'systems' (political-military, agricultural labour, commercial, maritime, industrial production, social communication, technological knowledge) that were themselves evolving during the colonial period, and through which these commodity networks functioned;
- 3) The impact of agents in the periphery on the establishment and development of commodity networks: as instigators and promoters; through their social, cultural and technological resistance; or through the production of anti-commodities;
- 4) The impact of commodity circulation both on the periphery, and on the economic, social and cultural life of the metropolises;
- 5) The interrogation of the concept of 'globalisation' through the study of the historical movement and impact of commodities.

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