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RAILWAY PHOTOGRAPHY AND TECHNOLOGY:

analysis of the photographic record of Brazilian railway in the 19th century

Fotografia e tecnologia ferroviária: análise do registro fotográfico de estradas de ferro brasileiras no século XIX

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ABSTRACT

The purpose of this text is to examine some sets of photographs about railway companies in Brazil, in order to highlight the potential of this type of iconographic material, not as artistic documentation but also technological documentation. We deal in particular with a collection of 6,000 photographs gathered by companies such as Companhia Paulista, Companhia Mogiana and Estrada de Ferro Sorocabana, which was deposited in the Museu da Companhia Paulista, in Jundiaí. These images were cataloged in 2014 by the RFFSA Inventory and IPHAN – within the attributions established to them by Law 11483/2007 – and then transferred to the Public Archive of the State of São Paulo. Although some images eventually had aesthetic quality, our first hypothesis is that the main reason for its production seems to have been technical: record of rolling stock or the evolution of construction work; therefore, this would be a routine activity in the companies that would explain the great volume of photographic material still existing. Secondly, we believe that the same material could be dealt with from the historical perspective of the technique and technology as an expression of technical-scientific knowledge and, often, by rules of machine representation and geographical space – although the pictorial tradition is not absent. This would demonstrate a potential for analysis of this type of iconographic material, where an interpretation proposed by the history of technology may not only enrich or complement studies of the history of photography, but also explore the importance of visual representation in technical-scientific knowledge.

Keywords: photography; railway; history of technology, public works; history of engineering.

RESUMO

O objetivo deste texto é examinar alguns conjuntos de fotografias de companhias ferroviárias no Brasil, a fim de ressaltar o potencial desse tipo de material iconográfico, não apenas como documentação artística, mas também tecnológica. Tratamos particularmente de uma coleção de 6 mil fotografias reunidas por empresas como Companhia Paulista, Companhia Mogiana e Estrada de Ferro Sorocabana, que estava arquivadas no Museu da Companhia Paulista, em Jundiaí. Em 2014, essas imagens foram catalogadas pela Inventariança da RFFSA e pelo IPHAN – dentro das atribuições que lhes foram estabelecidas pela Lei 11.483/2007 – e então transferidas para o Arquivo Público do Estado de São Paulo. Ainda que algumas imagens eventualmente tivessem qualidade estética, nossa primeira hipótese é a de que o motivo principal para sua produção parece ter sido técnico: registro do material rodante ou da evolução da construção da obra, o que seria, por conseguinte, uma atividade de rotina nas empresas e explicaria o grande volume de material fotográfico ainda existente. Acreditamos também que o mesmo material poderia ser tratado na perspectiva da histórica da técnica e da tecnologia, como expressão de um saber técnico-científico e muitas vezes por regras de representação de máquinas e do espaço geográfico – ainda que a tradição pictórica não esteja ausente. Isso demonstraria um potencial de análise desse tipo de material iconográfico, onde uma interpretação proposta pela história da tecnologia pode não apenas enriquecer ou complementar os estudos de história da fotografia, como principalmente explorar a importância da representação visual para o conhecimento técnico-científico.

Palavras-chave: fotografia, estrada de ferro, história da tecnologia, obra pública, história da engenharia.

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New technical documents to be explored, other guidelines to identify

> L`etude de tout document doit commencer par une analyse du contenu sans autre but que de déterminer la pensée réelle de l`auteur. [...] Le résult est de faire connaître les conceptions de l`autor, les imagens qu`il avait dans l`esprit, les notions générales au moyen desquelles is se représentait les monde. (LANGLOIS; SEIGNOBOS, 1898, p. 121).

Mid 19th Century photographers produced visual material of various industrial activities, but the recurring records of some railway related activities is striking: rolling stock manufacturing facilities, bridge construction materials, railroad construction. In our research of foreign rolling stock collections, for instance, we found a large amount of this type of industrial photographic records. In Brazil too, we found many photographic albums of rolling stock construction and renovation. As we shall see, the amount of this type of photographic material is quite abundant, though short of equally abundant studies.

The objective of this manuscript is to evaluate some sets of railway photographs in Brazil, to highlight the potential for this type of iconographic material, not only as artistic documentation, but also as a technology registry. We believe that this type of material could be used based on a historical perspective of technique and technology, as an expression of technical-scientific knowledge which is often guided by representation rules of machines and geographic space – even though pictorial tradition is not absent. This demonstrates a potential for the analysis of iconographic material, where an interpretation based on the history of technology may enrichen or complement studies on the history of photography and above all, explore the importance of visual representation in technical scientific knowledge.

We have observed that this type of documentation is rather vast and recurring in engineering libraries, museums or technology institutes abroad. The *Institute of Civil Engineers* of London boasts Isambard Brunnel and Charles Vignole photographic collections as well as construction records made by more than 200 photographers of the 19th and 20th Centuries (CHRIMES, 1992). In this extensive wealth of material, we point at a series of 356 images by English photographer Benjamin Robert Mulock (1829-1863), hired by Charles Vignole to produce images of *Bahia and Sao Francisco Railway* construction (Brazil, 1859-1861) (HANNAVY, 2008, p. 958-959; KOSSOY, 2002). The *National Railways Museum* (York) keeps more than 1.5 million images produced by railroad companies, railroad material contractors and official as well as private agencies. The *Museum of Science and Industry* (Manchester), holding British industry documental funds, keeps hundreds of locomotive construction company images in their collections.

In France, *Bibliotheque des Arts Decoratifs* (Paris) keeps a precious photographic fund of Louis-Emile Durandelle (1839-1917), who recorded the construction of the Opera Garnier and the 1889 Universal Exposition's Gallery of Machines, among other French buildings (KRIKORIAN, 2014). French photographer and painter Édouard Baldus (1813-

1889) participated in the *Commisson des Monuments Historiques* (1851) that produced an inventory of French architectural monuments. He was also commissioned to keep records of the successive renovations of the Louvre (1855 to 1969), which eventually built up to more than five (5) thousand images, now kept in the *Archives Nationales* (NILSEN, 2011, p. 104). His photographic productions about such monuments have earned him fame as an architecture photographer (HANNAVY, 2008, p. 107-112). Baldus was commissioned to produce an album for the *Compagnie des chemins de fer du Nord* (1855) and registered stations, railroad facilities, ports and towns all along between Paris and Boulogne-sur-Mer. Photographer Auguste-Hipollyte Collard (1812-c.1887) also contributed images to an album. Collard dedicated to producing records of various engineering works (bridges, overpasses, railroads). His work included outstanding collaboration with the "*Administration des Ponts et Chaussés*" and, mostly, in recording railway and public works expansion in France (HANNAVY, 2008, p. 308-309). There are various Collard albums about railroads and public works – some of which were published by the *Ecole nationale des Ponts et Chaussées* and by the *Ecole nationale des Ponts et Chaussées* e pelo *Ministère de l'Agriculture, du Commerce et des Travaux publics* – in archives of the *Bibliotheque Nationale de France*, *Bibliothèques spécialisées de la Ville de Paris, Musée Carnavalet* (Paris) and *J. Paul Getty Museum* (Los Angeles). In the photographic collectin of the 19th Century (MASTEAU; TRÖGER, 2013), the library of the *Ecole nationale des Ponts et Chaussées* keeps more than 10 thousand images produced between 1859 and 1890 by acting engineers.

In the United States, construction of the *Union Pacific and Central Pacific Railroads* (1868-9) was recorded by *Union Pacific*'s official photographer Andrew Joseph Russel (1832-1909), who was also a photographer for the *United States Military Railroad* during the US Civil War in 1862 (HANNAVY, 2008, p. 1225–1227; WOOD; NAEF, 1975, p. 201-204). In his turn, Alfred Hart was *Central Pacific Railroad*'s official photographer, registering construction of the section extending from Sacramento (California) to Promontory Summit (Utah) (WILLUMSON, 1988). Both series of records are now part of the 590 thousand collection archived in the *Union Pacifi Museum*, coming from *Union Pacific*, *Southern Pacific*, *Chicago and North Western* and *Missouri Pacific Railroads*. A one-thousand piece collection of glass plate images of different stages of the Central Pacific construction is in the archives of the *American Geographical Society* (PATTISON, 1962). There are also hundreds of stereoscopic railroad views produced by Russel in collections of the *Library of Congress* (in the period of the US Civil War), *Okland Museum of California, J. Paul Getty Museum* and *Union Pacific Museum*. The *Library of Congress* also has various collections by photographers hired by US railroad companies, such as those by Willian Henry Jackson. As a photographer of the *U.S. Geological and Geographical Survey* (1870-1879), he had already kept records of the Yellowstone river region, under the direction of F. Hayden (Hales, 1988). He faced significant difficulties to register images in stereoscopic cameras and collodion in a natural setting. He was also a photographer with the *Northern Pacific Railroad* for some years (1876-1905) and worked for the *Canadian Pacific Railway Company* (1881) during line construction as well as for the *Baltimore & Ohio Railroad* (HANNAVY, 2008, v. 2, p. 765-766). By virtue of the experience he amassed from the

geological expeditions and from railroad companies, he participated in the *World`s Transportation Comission* (1894-1896), organized by Joseph Gladding Pangborn, who visited tens of countries in search for information on worldwide transport systems at the time. Nine hundred images produced by Haynes in this expedition are in the *Library of Congress* archives, in the *World's Transportation Commission* documental fund ("World's Transportation Commission – Digital Collections", [s.d.]). We can still find more than a thousand Jackson images in the *Detroit Publishing Company Colletion* – a collection of 25 thousand glass negatives in the *Library of Congress* archives. There are collections from locomotive and tram construction companies containing more than 6 thousand images in *The Historical Society of Pennsylvania*, and thousands of others in the *Washington University Library*.

In the US, where railroad construction was contemporary to the photographic technique, many other photographers worked alongside those companies to produce record-keeping or propaganda photography: William Herman Rau (1855-1920), for the *Pennsylvania Railroad* and *Lehigh Valley Railroad*; James Fitzallen Ryder (1826-1904), for the *Atlantic and Great Western Railway*; Benjamin West Kilburn (1826-1909), for the tourist railroad *Mount Washington Steam Railway Company* (1869); Willian Nicholson Jenning (1860-1946), for the *Pennsylvania Railroad* (1885-6); H. H. Bennet, for the *Chicago, Milwaukee and St. Paul Railroad* (1876-1880) and *Wisconsin Central Railroad* (1890) (BROWN, 2001; HANNAVY, 2008; HOELSCHER, 1998). Amongst those, we would point at the work done by Frank Jay Haynes (1853-1921) as he registered construction and propaganda images for railroad companies. Haynes was a photographer for the *Northern Pacific Railroad* during many years (1876-1905) and worked for the *Canadian Pacific Railway Company* (1881) during line construction. Between 1884 and 1905, he produced images of Alaska and the Yellowstone National Park. Disseminated by the *Northern Pacific Railroad* company, those images helped encourage the then incipient local tourism (Hannavy, 2008, v. 1, 643-644). Examples of the production by those photographers and other anonymous ones are kept within the collections of US foundations, museums and universities (*e.g.*, *Smithisonian Institutution*, *J. Paul Getty Museum* and *The Metropolitan Museum of Art*).

This wealth of materials can also be observed in Brazil. Marc Ferrez was one of the most active photographers producing images and albums for various railroad companies, including *Estrada de Ferro Minas e Rio* (1881-1884), *Estrada de Ferro Príncipe Grão Pará* (1882); *Estrada de Ferro do Paraná* (1880-1884); *Estrada de Ferro do Corcovado* (1884); *Estrada de Ferro D. Thereza Christina* (1884), and for the *Great Southern Railway* (1889).[1] Ferrez also rendered photographic services to the *Estrada de Ferro D. Pedro II* (1882). Many of those albums as well as some others are currently in the archives of the National Library, in Rio de Janeiro, as part of a Photographic Collection put together by D. Thereza Christina (the wife of Peter II, emperor of Brazil, 1840-1889). There is complementary (or duplicated) material produced by Ferrez that belongs to Moreira Salles Institute, a privately owned Brazilian institution specialized in visual arts. In São Paulo, Guilherme Gaensly (1843-1928) also produced relevant material covering engineering works, including both railroads and urban transport, highlights of which go to the *São Paulo Tramway Light and Power Company* (SPTLP

Co.) on streetcar rail and infrastructure construction (1899-1925). The iconographic material gathered by the company along its operation was initially organized in the 1980's. As the São Paulo Energy Historic Heritage Foundation was implemented in 1998, the iconographic documentation, among others, is given treatment and cataloging to match its historical importance. Within the collection of 260 thousand images produced by São Paulo's gas and electricity companies since the early decades of the 20th Century, Sergio Burgi's research work led to attributing 781 of those records to Guilherme Gaensly (DIETRICH *et al*., 2001). In 2014, the Public Archives of the São Paulo State received 194 thousand images of the old *Ferrovias Paulistas* (FEPASA) – produced by both the centuries old railroad companies, which were later merged into a state owned company, and that same company back in the 1960's and 1970's. That is an expressive amount (tens of thousands of images) suggesting, superficially, that it is composed of homogeneous groups of images (machines, work in progress, constructions) with little formal concern. We would point at the fact that, in Brazil, where company collections were not the focus of relevant preservation – and, given the RFFSA inventory demand, railroad company inventories are still being treated – there is still some unknown photographic and scattered material to be identified and studied.

Comparing with the amount of material listed, studies directly addressing this railway iconography are few. In studies of photography history, which have already delved into this type of iconographic material, the first explanatory line is to treat it from an aesthetic and authorial perspective; that is, it ought to be an investigation of the photographer as a creative unit, as the author of an aesthetics of the images. The Baldus photographs of railway structures along the Lyon to Toulon line would be geometric representations within a classic view of the history of architecture, which, confronted with the images of Côte d'Azur and geological formations, symbolize the contrast between civilization and nature (HANNAVY, 2008, p. 107-112). In recent decades, Andrew Joseph Russell's images have been evoked in US art museum exhibitions on account of their iconic power: as symbols of the US Western Frontier that built America (GULLIFORD, 1992; HYDE, 1990). To other authors, in their turn, railroad photographs taken in the mid 19th Century would represent the progress of industry, of the construction of French railroads and stations (Eduard Baldus, Chemin de fer de Gèneve, 1854; Auguste-Hippolyte Collard, *Le Chemin de fer de l'Etang-la-Ville à Saint-Cloud. Viaduc de Marly. Vue prise du chemin de la Briqueterie*, 1885), of the new railroads crossing the Alps (like Semmering Railway, 1848-1854), of large bridges (James Valentine, *Forth Bridge from the North*, 1889), of rails crossing Brazil's Serra do Mar (Marc Ferrez, *Tunel da Grota Funda, estrada de Ferro Paranaguá-Curitiba*, 1884), the Argentinean pampas (George Poulet, *Construction de la ligne de Sante Fe à San Cristobald*, 1880) or the Andes (Ricardo Villalba, *Ferrocarril del Sur. Puente de Sumbay*, 1874) (MAJLUF, 2000; NILSEN, 2011). To those scholars, those images "reflected technological development" and portray the "corporate entrepreneurship", in addition to promoting railway projects. To those scholars, those images "reflected technological development" in the USA and portray "corporate entrepreneurship", they compound propaganda of the nation by means of "una imagen de modernidad y de desarrollo tecnológico" in the Spain of Isabel II (AGUILLAR CIVERA, 2007) or

they merely promote engineering projects. In fact, there seems to have been a great many records or photographic compilations to promote public works (of a nationalistic nature) or companies, particularly at the time of universal exhibitions (MATOS, 2014, KOSSOY, 1999). Common to all those studies, the main thesis is that, "the photographs of technology and progress retain the conventions of an academic pictorial tradition" (NILSEN, 2011, p. 94). In one of the very first studies on US landscape photography, James Wood and Weston Naef observe that painters and photographers were in great proximity, both because the former could use photographic images as models and because they participated in common assignments, such as in the scientific expeditions by F. V. Hayden (photographer W. H. Jackson and painter Thomas Moran in 1870-2) or by geologist Clarence King (photographer C. E. Watkins and painter John Henry Hill in 1868). (WOOD; NAEF, 1975, p. 64). This allows for a comparative aesthetic analysis or an evaluation of alleged pictorial influences – such as the aesthetics of picturesque romanticism – or of literature – such as Emerson's poems. (HALES, 1996; HOELSCHER, 1998, p. 552). The biography of many painters such as Andrew Russell, Alfred Hart and Eduard Baldus, who were themselves painters before dedicating themselves to photography, would eventually corroborate that thesis (BOYER, 2003; NILSEN, 2011; WILLUMSON, 1988; WOOD; NAEF, 1975, p. 204).

An investigation of late 19th Century civil works and railroad construction photographs and albums in Brazil revealed some significant authorial studies, such as those by Boris Kossoy or Lima and Carvalho's semiotic proposal (KOSSOY, 2002; LIMA; CARVALHO, 1997). The pictorial standard of urban views found in early 19th Century Brazil would appear in photographic records because it catered to a local consumer market for this types of images (KOSSOY, 1984, p. 5-6). Ferrez's landscape photographic images were often interpreted as propaganda for a nationalistic imagery (KOSSOY, 1999, p. 111), or even images produced by Gaensly for a São Paulo landscape album (1904) seemed to also follow the standards of architectural registers, according to Solange Lima and Vania Carvalho: a diagonal perspective to capture volumetric aspects; birds view takes (from balconies or towers) to avoid façade distortions and to benefit from light enhanced contrasts of the architectural proportions (LIMA; CARVALHO, 1997, p. 99–100). According to the same authors, Gaensly would thus replicate French photographers Edouard-Denis Baldus and Adolphe Braun, who recorded monuments and public buildings in Paris in the mid 19th Century. Just as in other foreign studies (HALES, 1996; WILLUMSON, 1988; WOOD; NAEF, 1975), the photographic image analysis categories proposed by photography historians in Brazil were based on the bibliography of the history of art, on theory of the image, and on an analysis of the plastic arts (LIMA; CARVALHO, 1997, p. 50). According to the theories adopted in this historiography (Roland Barthes e André Bazin), the autonomy of artistic production and, consequently, of the visual source to be considered by the technical and aesthetic options adopted by the photographer is assumed. This perspective informed an analysis of the photographs made of cities, particularly those of early 20th Century urban reforms of Rio de Janeiro, São Paulo or Porto Alegre (POSSAMAI, 2008). The images could thus be decoded with symbolic productions about the reforms, which provide access to a sprouting urban imagery (ARAUJO, 2016).

Another current line of analysis is an emphasis on the documental nature of this iconographic material. James Wood and Weston Naef argued that this material "illustrated the progression of a construction job" for the companies or added to photographs for travelers. (WOOD; NAEF, 1975, p. 42). The underlying suggestion is that this material played a secondary role: "to illustrate" the evolution of railway projects, bearing witness to a real event. They could thus be acknowledged as witness-documents of a technical event or process: as illustrations of the history of engineering and architecture (REIS FILHO, 1989; TOLEDO, 1987).

For both reasons (a photographer's choice and a documental nature), Ricardo Mendes disputes the characterization of urban construction or public works photography as "technical documentation", given that they are images that have been commissioned by a company and therefore the photographer's commitment with client demands would carve into the alleged impartiality of an image whose purpose was "technical", considering that the client's objective of a commissioned job would affect an exempted record of a photographed model, according to Mendes (DIETRICH *et al*., 2001, p. 85). As a counterpart, in the absence of this conditioning factor, as in photographs of urban sights (sold as individual pieces or in albums, or as postcards later on), a photographer could exercise a photographic language and his "authorial style". "They are not commissioned and therefore subjected to client criteria abiding by stereotype models, but rather finished products to be marketed". (LIMA, 1991, p. 67). That's why they are authorial images, with the status of "artistic documentation", and subject to be analyzed by the history of photography. From this perspective, there is some relevant work out of authorial photographic record of engineering works in Brazil about Marc Ferrez (MELLO, 2015; TURAZZI, 1996, 2006; TURAZZI; MELLO; SILVA, 2012). In counterpart, following the same line of interpretation, photographs would be more understandable because of their authorial nature (Marc Ferrez's photography) than because of the photographic motif (engineering works). That is to say that the visual coherence of technology or engineering photography would be interpreted as a photographer's exclusive aesthetic solutions.

At the same time, this explanatory line – an "artistic document for advertising" with authorial style, but economically compromised – conforms to the argument of its massive use as advertising material by the same companies (HANNAVY, 2008). There was several images that would have been motivated by traveling, or even promoted by companies, offered in the form of stereoscopic views in the 1860s-1870s, by postcards from 1880-1890 or in US illustrated magazines in the later 19th Century.

From the perspective of photography as a documental source, Gaensly's cityscapes are overestimated by studies investigating the history of cities. There is one line of analysis adopted by a study of another Brazilian photographer, Militão Azevedo, that registered a recently inaugurated railroad crossing over the Serra do Mar towards the countryside. (CAMPOS, 2007, p. 85). To increase that illustrative function of photography, the newer analyses of social history emphasized the readability of portraits and photographs of human groups from the perspective of behavior, everyday life, gender or ethnicity, and social conditions. (CARVALHO, 1991, p. 11-82; KOSSOY, 2002, p. 266-

267). This line of interpretation takes photography of urban architecture as testimony to urbanistic changes experienced by a city – including the implementation of urban transport and public electricity.

Explanations are offered that point at a contradiction between the testimonial nature (as a resource to historians of architecture or of the city) and the very production of images by and for the companies (the original reason for recordkeeping). That is what drove Ricardo Mendes, for instance, to set restrictions to the term "technical photography", as based on the opposition between (true) objective reality and the (false) subjective perspective. The opposition is further reinforced by the point of services being rendered by a photographer, whose attention to the "client's" interest has marred the photographic testimony. From this perspective, economic demands or the mere intent to advertise may hinder objective exemption. This trend of thought steers whatever interpretation of railroad company photographs (or those of any other industry) towards the debate on "photographic realism"; that is, wouldn't the "testimonial nature" (their status as "historical documents") of photos by Auguste-Hipollyte Collard, Alfred Hart, Guilherme Gaensly or Marc Ferrez be committed to the commercial purpose of the images? Along that trend of studies into the history of photography, any attempt to explain technology photographs (railroad, civil or industrial construction) or even scientific photography (such as those from expeditions) is a fallacy, because there would always be "underlying interests" or ideologies "marring" the material thus produced.

Ours is a different perspective. After all, this understanding of visual studies is an upfront hindrance to identifying scientific aspects or technological purposes allegedly because scientific objectivity is a 19th Century myth or because this material is "conditioned" by the requester, which spoils the testimonial nature of the image. Hence, resorting to photography as a primary source for studies on technology may suffer from a customary confusion between objectivity (as a purpose) and context (articulation with techno-scientific practices or other scientific forms of visual representation). Firstly, because we suppose a technical outlook is not exempted from intentions – in this case, intentions that may be part and parcel of the purpose of keeping records of railroad construction works progress. Secondly, because we believe the photographic motifs may require rules of their own – as Lima and Carvalho and Nilsen also suppose about architecture photography.

We would like to emphasize that our objective is to examine some sets of railway company photos in Brazil, to highlight the potential for this type of iconographic material, not only as artistic documentation, but also as a technology record. In special, there is a collection of 6 thousand photographs gathered by companies such as Companhia Paulista, Companhia Mogiana the Sorocabana Railway, which had been archived at the Companhia Paulista Museum in Jundiaí. In 2014, these photos were catalogued by the inventory of the extinct RFFSA and by IPHAN – according to the attributions granted by Law 11,483/2007 – and then transferred to the Public Archives of the State of São Paulo. Even though some photos eventually had esthetic quality, our main hypothesis is that the main reason for their production was technical: to record manufactured

materials or the progress of construction, in other words, a routine activity for the companies, explaining the still existing large volume of photographs.

Engineering photographs and railway records

At a first examination of the photographic material on Brazilian railways we noted a prevalence of images from the time of railway construction or immediately after the beginning of operations. In fact, a large part of this material was requested to be produced by the companies. The photo albums produced between 1858 and 1884 and currently archived at the National Library (Rio de Janeiro) are a good example of this type of material: *Recife and Sao Francisco Railway Company* (Augusto Stahl, 1858-60), Recife to São Francisco Railway (Guilherme Gaensly, 1870), Brazilian Imperial Central Bahia Railway Company Limited (Guilherme Gaensly, 1878), *Chemin de fer de Rio Grande à Bagé* (Augusto Amoretty, 1881-1884), Paulo Afonso Railway (Ignácio F. Mendo, 1880), *Collection of 44 photographic views of D. Pedro II Railway* (anonymous, 1881), Minas and Rio Railway (Marc Ferrez, 1881-1884), Príncipe Grão Pará Railway (Marc Ferrez, 1882); Paraná Railway (Marc Ferrez, 1880-1884); Corcovado Railway (Marc Ferrez, 1884) and Donna Thereza Christina Railway (Marc Ferrez, 1884). The publications on the Exhibit of Brazilian Railways held in 1887, suggest that a lot more photographic material was produced at the time. Nineteen railway companies, engineers, the Rio de Janeiro Engineering Club, the Board of Directors of Public Constructions, the Polytechnic School, printing-offices and mining companies participated in the event. A consult to the exhibit catalog revealed at least 450 photos, most of them produced by anonymous photographers and taken for the railway companies. Could the volume of railway photographs – still small when compared to France or USA, but expressive for a country where intense railways construction started on the 1860's – have explained the reason for the advertisement? What could have explained the investment made by the companies for this record? Little documentation was found on the authorship or on the hiring of a photographer to explain what were the working conditions. Thus, some explanations may be suggested to compare them to their foreign counterparts.

First of all, we noted the photographic record of railway engineering activities was already in use in the early 19th century in the countries where the railways were first constructed. The first constructions of British railways in the 1830's were recorded in illustrations, including a publication at the *Illustrated London News* (CHRIMES; RIBEILL, 1998). However, the procedure seems to have become more frequent after 1850, in France and England. The *Royal Engineers* included photography in the training of military engineers, who started using it in different construction sites – as was the case of the *South Kesington Museum* (1856) (HANNAVY, 2008, p. 66). Teaching photography was also included in the training of engineers at École de Ponts e Chausses at the end of the 1850's.

Second, the use of photography was adopted by engineers and restoration architects who considered the potential of photography as a new technique for the visual registry of constructions which took into account the potential of photography as a new visual registry technique, in addition to other practical uses. In France, the

identification of historic monuments, known as *Mission Heliographique* (1851), had an extensive production of visual material, including the photographic registry made by different photographers, among them Eduard Baldus (BOYER, 2003). Between 1853 to 1855, Philippe Delamotte recorded the complete construction of the Crystal Palace, in Sydenham. During the construction of Kiev's suspended bridge Kiev (1847-1852), projected by Charles Vignoles, a series of photographs depicting the construction process was produced by J. C. Bourne and Roger Fenton (VIGNOLES, 2012).

Third, many records were made for foreign capital companies or companies whose project was developed by foreign engineers (administrators, shareholders or engineers) to whom the remote monitoring of the construction was necessary: *Recife and Sao Francisco Railway Company* (British administration); *Rio Grande to Bagé* Railway (Belgium administration of the *Rio Grande do Sul Compagnie Impériale du chemin de fer*); *Brazilian Imperial Central Bahia Railway Company Limited* (British capital); *São Paulo (Brazilian) Railway Company* (British administration and capital); *Paranaguá to Corityba Railway* (administrated by the Compagnie Générale e Chemins de Fer Bréziliens); *Minas and Rio Railway* (British capital); Brazil *Great Southern Railway* Limited (British capital); Donna Thereza Christina Railway Company Limited (British capital). The training of engineers may also by a hypothesis to consider as a motivation for these photographic records, since many of them could have been hired with this practice at the Polytechnic School (Brazilian or foreign) or participation in previous constructions: in the case of the registry of the *Paranaguá to Corityba Railway* (Figure 1)*,* Príncipe Grão-Pará Railway and Corcovado Railway, all of them designed by engineer Pereira Passos, just as the D. Pedro II Railway, whose photographic visits were performed at the end of the 1876-1880 term; the Paulo Afonso Railway, designed by engineer André Rebouças, planned by North-American engineer Willian Milnor Roberts, location and construction monitored by German engineer Reinaldo Von Kruger and railway settlement by engineer Jean Guillaume Monthier; or the *Great Western of Brazil Railway*, *Conde d'Eu Railway Company*, *Donna Thereza Christina Railway* and *Southern Brazilian Rio Grande do Sul Railway*, all of them designed by British engineer Charles Neate. The foreign administration per se could justify sending photographs of the construction and/or operation and finally, of the *Paranaguá to Corityba* Railway and *Conde d'Eu Railway Company,* with the participation of engineer André Rebouças.

Finally, even if the advertisement of the construction (for the company or engineer) is a feasible hypothesis for the objective of these images, we highlight that the engineers in charge may have requested them as a professional practice. The monitoring of the construction seems, therefore, to be one of the main reasons for this wealth of iconographic materials on Brazilian railways at the end of the 19th century – and that is why we could also consider that part of the registration patterns (theme and form) might be identified in this type of engineering photography, which are also seen the collection of the consulted companies – even those of the first half of the 20th century.

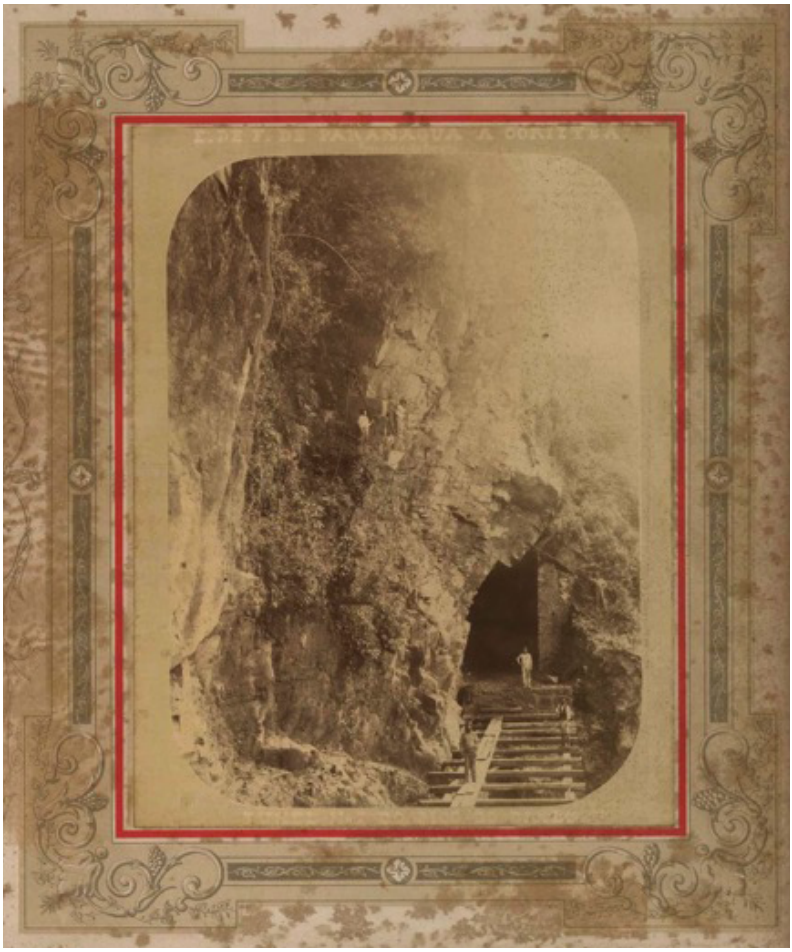

Figure 1: Marc Ferrez, Paranaguá to Curitiba Railway: Province of Paraná: tunnel n. 7 of *Pico do Diabo* [1880-1884]. Collodion, P&B.
Source: Collection Thereza Christina Maria, Biblioteca Nacional, Rio de Janeiro, Brazil.

Objective of the photographs

A first standard is the immediate purpose of photographic images, already pointed out from the first explanations given by the engineers. Charles Vignoles was the first to defend it at the Royal Photographic Society (London, 1853). The inspection of the construction, using the records of the construction works, and practical guidelines are the reasons given by Charles Vignoles for the use of photography.

This resource was used by the British engineer in another opportunity. Vignoles, who had already designed different railways in England (London & Brigton, Liverpol & Manchester and Dublin & Kingstown), is responsible for the *Bahia and San Francisco Railway*, in Brazil (1858-1862). He designated his son, Hutton Vignoles, as a resident-engineer for the company. Photographer Benjamin Mullock was also hired to make photographic records for the railway constructed in Bahia from November 1859 and February 1862 and then send them to Vignoles. The whole work comprises a series of approximately 360 images, currently filed in the library of the Civil Engineer Institution. There is a complete breakdown of the stages of building constructions, such as the workshops in Periperi (from the landing of the material on 27/12/1859 until the end, on 07/03/1861), warehouses or the station (27 photos from 9/03/1860 through 5/09/1861) (Figure 2); as well as different land shots, earth movement, trackbed preparation and laying of rails, viaducts and bridges, tunnels. There are also two images of the accident caused by the fall of the iron structure of the gare, which had just been installed. The photographic records are not occasional: they refer to the main constructions, in different time points, always aiming at identifying the project that is being carried out. Probably for Vignoles to be able to monitor the construction from a remote location.

In Brazil, another early example is the construction of the Grota Funda (SP) viaduct connecting to São Paulo Railway (in the album Views of the São Paulo Railway, 1865), whose photographs are attributed to Militão de Azevedo. (BARBOSA, MEDEIROS, GLEDHILL, 2010, p. 95, 97, 103).

Thus, a set of images was produced in different stages of the construction of the railway: the preparation of the ground, earthwork, leveling of the trackbed and laying of railways were common reasons. It was observed in another group of images, relating to buildings or constructive works (manholes, tunnels, bridges, platforms or viaducts), in their different stages of construction. In any case, there is a registration of the construction site, with a group of workers, scaffolding and other construction materials.

We found a series of images within the iconographic collection patterns of the São Paulo State companies in the 20th century – including several examples of the use of the human scale to examine the constructions. The construction of the bridge over the Tietê River in 1903, designed by engineer José Ayrosa Galvão for the São Paulo State Raiway and Rivers, was recorded in several stages: from the placement of wooden scaffolding, construction of columns, masonry of the bridge headwalls, placement of the metallic structure and, finally, the inauguration (Figure 3).

This type of photographic record of railway infrastructure construction is used throughout the 20th century, as seen in the series of photos of the implementation of the Mayrinque to Santos line (1929-1938) by the Sorocabana Railway, with highlight to the construction of tunnels, bridges and viaducts (Figure 4).

Both the occurrence of a homogeneous series of images of the construction of the same railway (4 to 10 photographs) and the incidence of this type of record in different years indicates that it was not an isolated condition, but rather a common company procedure and work opportunity for the photographer. This registration pattern is used in the 20th century, as seen in the sequential record of 26 images on the progress of

Figure 2: Benjamin Mulock. Bahia Station. Front. Mar. 6/[18]61". Albuminated Paper. P&B.
Source: Collection Institution of Civil Engineers (London, United Kingdom).

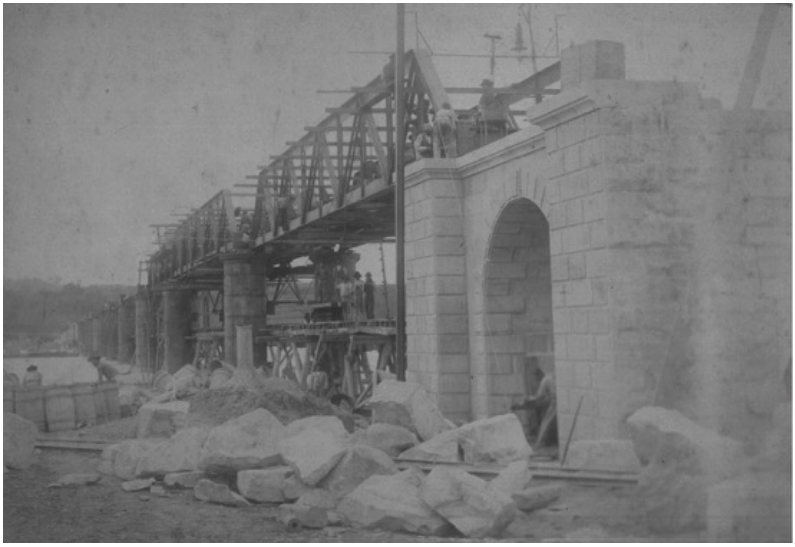

Figure 3: Bridge over Rio Tietê. Iron structure assembly (1902-1903). Unknown author.
Source: Museu da Companhia Paulista (Jundiaí, SP, Brasil).

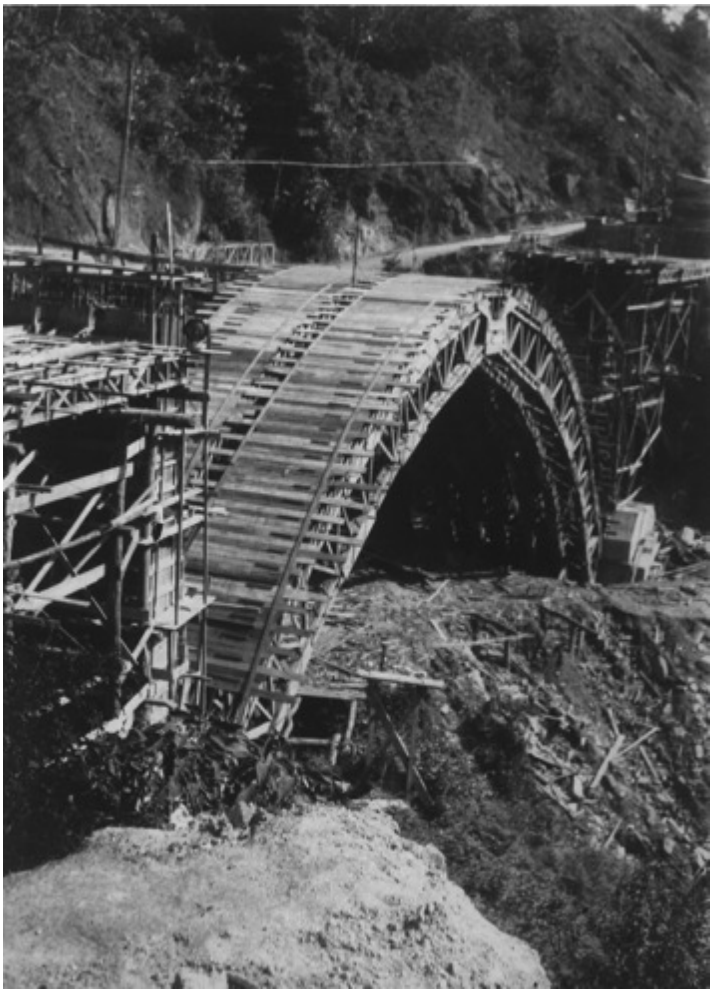

Figure 4: Bridge over Rio Tietê. Iron structure assembly (1902-1903). Unknown author.
Source: Museu da Companhia Paulista (Jundiaí, SP, Brasil).

the construction works of the new Ribeirão Preto station, Mogiana Company, designed by the architect Oswaldo A. Bratke (1965) (Figure 5). It has become a standard for all kinds of public works in recent decades, including as a legal requirement beyond any claim of "absolute objectivity" that visual historiography can make to such documentary photography.[2]

Figure 5: Construction of the new Ribeiro Preto Station (1964).
Design by Oswaldo Bratke. Unknown author.
Source: Museu da Companhia Paulista (Jundiaí, SP, Brasil).

Motifs or themes

The second pattern refers to the motifs or themes of the images. A study and classification of the images presented by two dozen companies at Railways Exhibit (1887) resulted in the following motifs: passenger buildings and constructive works (bridges, viaducts and tunnels) railways and workshops – a representative distribution of the "most important works" from an architectural and engineering point of view. In the iconographic collection filed at the São Paulo State Company Museum until 2012 (6,345 images accounted by the Public Archive of the State of São Paulo), it was possible to quantify some of the reasons for the records: art works (bridges, manholes, viaducts) were the largest number (1205 photos); buildings (586 between stations and workshops); followed by permanent railway imaging (483); materials (461); machinery (406); festivities or people (385). In addition, there were complete series of records of buildings and materials: "São Paulo State Company Railway Photography Album" (stations), "Mogiana Constructive Works" (bridges and viaducts), "Mogyana Company Album – Buildings", "Mogyana Company Album – Transportation", "Mogyana Company Album – Workshop and Rolling Stock". Although complete photographic production may have been lost over time, it is very representative of the routine maintenance of railway infrastructure. The existence of a larger number of constructive works is understandable both because of the larger number of constructions during the implementation of the lines and because of the replacement activities (precarious

wooden structures replaced by definitive iron, masonry or concrete structures); as well as rolling stock and machinery that was purchased or constantly repaired. The registration of buildings (stations or workshops) is aimed at the completion of the construction and operating conditions.

Formal aspect of the images

The third pattern may be called formal, especially with regard to image framing. In our view, the framing characteristics may be based on different visual traditions. Although the pictorial tradition is recurrently cited as the main photography model in the first years, we will try to point out other aspects that may have guided framing or camera position. In order to understand the interrelationship between the photographic record and the engineering work and to have a better understanding of photography services in the nineteenth century, it is also necessary to be aware of the relevance attributed to it by geology and engineering sciences. The instructions are given by Frank de Yeax Carpenter, civil engineer of the Geological Commission of the Empire, headed by Charles Hart, with the participation of Marc Ferrez in the team. According to Carpenter, engineers can obtain an accurate geographical survey of the terrain and the representation of space may be based on the triangulation system. (CARPENTER, 1880). The search for high mountain peaks allows each of the triangulation stations to be obtained. From the top, engineers can produce a sketch of the relief drawing. However, "picturesque effects" should be avoided, as they may neglect the representation of "what is vitally important to the project". From the station, drawings of the surface of the terrain may be performed as a perfect copy. Photography, in turn, could represent the details of the geologic structure, the nature of surface and conditions of the terrain of a geographic space with emphasis on the details of the physical surface of the terrain. (CARPENTER, 1878, 1880). The best registration position was at a triangulation station, especially from the peak. This enabled a topographic registry, which was convenient, but not the main objective; however, picturesque effects were not desirable in this case.

Topographic framing was used to obtain tracings and in the construction of the railway bed (Ignácio F. Mendo. *Estrada de Ferro de Paulo Afonso: Kilometer 26*, 1880), in addition to the topographic measurement: forward view and the backward view, used for the identification of longitudinal level – whose orientation is found in Pereira Passos guidelines. (PASSOS, 1912, p. 44-45). This pattern was used in the São Paulo Railway views by Militão Azevedo (1868), in *Raiz da Serra, Viaducto e Casas de Machinas no 3º Plano*", in *Vista pelo 1º Plano inclinado acima* and in *Estação de Belém em obras* (1868), framing was also observed in the images focusing on the rectification of lines in the 1930's, by the São Paulo Company and Mogiana Company. Hence the need to record tracings or infrastructures (trackbed, embankments and constructive works) often times to inspect the construction, demanding appropriate framings from the photographer for each motif and function.

The perspective of the engineer takes into account the terrain demarcation in the designed tracings (called "location"), especially the demarcation of curves based on "deflections over the tangent" (adopted in the United States and in Brazil, in the

nineteenth century), where the beginning and end of curves are defined in the design ("PC" and "PT"), based on which the tangents and curve degrees are calculated. In a bridge design, the drawing of the curve would also provide details of the tangents. This geometric perspective is seen in tracings and photos produced after the 1860's where the camera is placed in the beginning of the railway curve.

This type of framing to obtain images at the beginning of a curve is frequently observed in railway construction inspections. It was used by Militão de Avezedo in the pictures of the *Túnel da Cachoeira, Depois do Túnel* [of the Waterfall] and in the São Paulo Railway views, in 1867. It was also possible to find it decades later in the construction records and line rectification designs in the 1930's (Figure 6).

Alternatively, the framing is frontal with an object placed perpendicularly to reproduce the profile plan of the project. This pattern can be found in several images made by Auguste Collard (Pont de Solférino: vues prises pendant l'exécution des travaux in 1859, Pont au Change: vues photographiques des phases principal des travaux de reconstruction de ce pont, exécutes in 1858, 1859 et 1860), which made it possible to compare the design in longitudinal drawings with the photograph of the head of the bridge already completed (see planche II and XIV of *Album photographique du pont-viaduc sur la Seine au Point-du-Jour*). The same pattern will often be found in photographic records in Brazil; obviously not because of an "influence" of the French photographer, but rather because it is better suited to the contingencies of construction inspections – and even more so as a reference to the principles of design drawing in engineering. This same orientation was used in the records of concluded railway projects throughout the twentieth century (Figure 7).

It noteworthy that the presence of a single man alone in the photographs is a detail commented on visual studies as an example of a romantic conception of the picturesque, of the scale of the human dimension against the wild nature. (WOOD; NAEF, 1975). At other times, the presence of the workers is explained as a symbol of man's power over nature, where "the stages of transformation imposed upon nature by the interference of labor" is (CARVALHO, 1991, p. 224).

In the material of Brazilian photographers obtained from the railway companies, the presence of human figures in railway photographs is observed at some specific moments: in the records of embankments, construction of tunnels or bridges. We can see construction workers standing at the tunnel entrance, on top of a bridge or base of a pillar. Always standing, facing the camera and sometimes sideways. By means of visual engineering records works, as mentioned above, the activities could be monitored according to the proposed project. However, a real parameter must be used as a reference inside the image. In topographic surveying, a metric ruler was used as a measuring reference with theodolite. In the earlier records, any engineering object could work as a reference – Benjamin Mullock resorted to a theodolite tripod (*Entrance to Mapelle Tunnel, Bahia and San Francisco Railway*, 1859), but human presence became more common to fulfill this function of scale (Marc Ferrez, *E. de F. de Paranaguá, Corityba: Paraná Province: tunnel no. 7 of Pico do Diabo* [1880-1884], see Figure 1. The use of a ruler was not a personal or national brand name, since it

Figure 6. End of the Jaú branch rectification, Segment between Itirapina and Três Córregos (c.1930). São Paulo Railway. Unknown author.
Source: Museu da Companhia Paulista (Jundiaí, SP, Brasil).

Figure 7. End of the construction of the upper passage in masonry and iron, km 104. Mogiana Company (19??). Unknown author.
Source: Museu da Companhia Paulista (Jundiaí, SP, Brasil).

repeats images by different photographer, at the same time, in different countries: A. J. Russel, in *Mallory`s cut, near Sherman* (Wyoming, EUA) (1867/68); Martínez Sanchez Ferrocarril del Norte, Viaducto de Pangoa (Spain) (1867); Auguste Collard, *Viaduc de Marly, Vue prise du chemin de la Briqueterie* (France) (1884); Eugène Courret, *Ferrocarril Central, [Bridge over] Rio Blanco* (Argentina) (1875). Therefore, the human figure was adopted as a visual parameter to check the dimensions of the construction, since the photographic registries were produced for the engineers in charge of the construction. This resource may be observed in the photographs of railway construction in São Paulo, not only in the 19th Century, but also throughout the 20th Century (Figures 1, 7, 9 and 10).

The photographic records of construction inspection activities obtained from the iconographic collections provide a frontal view pattern that allows us to see the cuts of land and embankments for implementation of the road and opening of track beds or rectification of the road. In the first case, the camera on the ground, parallel to the line, brings the embankment to the center of the image. In the case of cuts of land, the camera close to the ground with an escape point records the perpendicular cut – to check the angle according to the Project or the situation of stability of the terrain. The rectification of the Jaú branch line by the Companhia Paulista de Estradas de Ferro (1929-1931) offers different examples of this pattern.

These photographs are taken close to the ground, to record the railway line settlement (with the railway in the middle as an escape point), enabling the inspection of ballasts and alignment of tracks (Figure 8).

Another type of recurrent framing is that of the orthographic perspective. In this type of perspective, the observer (the camera, in this case) is positioned at an angle with respect to the escape line (usually 45 ° or 30 °), which allows the representation of volume or relief and even to calculate the position (or dimension) of the other elements within the images by angle projection. The isometric perspective was also used in engineering for orthographic drawings of objects since the beginning of the 19th Century. This probably made it easier to admit the value of photographs, which enable a spatial composition.

We have seen this pattern since the first railway constructions in Brazil, especially for the images of bridges and viaducts, since it provides details of the constructed structure (columns and pillars). This is the case of the *Grota Funda* viaduct record, already concluded (1868), by Militão de Azevedo (Figure 9). A similar perspective was used in the engravings by W. H. Rinkin (resident engineer of the São Paulo Railway), which recorded the construction of the same viaduct and was reproduced in *The Engineer* (28/12/1868, p. 508).

The construction of the bridge over the Tietê river, in 1902-1903 (Figure 3), allows for a better verification of the masonry and iron structures for the technical monitoring of the construction by the design engineers. That is why we believe that the photographs of the railway settlement are not based on artistic standards, but rather on technical design guidelines and construction inspections.

Figure 8: End of the Jaú branch rectification, Serra de Brotas segment (c.1930). São Paulo Company. Unknown author.
Source: Museu da Companhia Paulista (Jundiaí, SP, Brasil).

Obviously, there were interfaces between the pictorial and technical guidelines – to which we welcome some aspects of historiography and visual sources. First of all, the landscape painting guidelines lent themselves to the urban views, very common in the early 19th Century, then reproduced in the first photographic records. The interaction among the different visual guidelines should be further explored; however, we know for a fact that they were present in the photographic records of the railways. An example of this type of convergence might be observed in the album *Vistas da Estrada de Ferro de São Paulo in 1865*, attributed to Militão de Azevedo (FIGURE 10) (BARBOSA; MEDEIROS; GLEDHILL, 2010, p. 95, 97, 101). A selection of images from São Paulo and the recently constructed railway had been disseminated in England, with dates prior to the album and identical framing.[3] The negatives belonged to Daniel Fox (resident engineer of the São Paulo Railway), who probably used them to disseminate the construction. A lithograph of the *Grota Funda* viaduct, reproducing a similar image of the same viaduct, was published by *Harper`s Weekly* (New York, 12/05/1868, p. 780). We emphasize that the photographic records of bridges, buildings and points of operation along the São Paulo Railway would hardly have been done on Militão de Azevedo's own initiative, since there was a technical selection of points for registration – which can be identified in the album (for example, "Cutting no. 18",

Figure 9: Militão Augusto de Azevedo. Grota Funda Viaduct (c. 1868).
Source: Collection Library Mário de Andrade, São Paulo, SP, Brazil.

Embankment no. 12 ", intersections, needles), as well as operational shutdowns record the image (which should take a few minutes). It was certainly commissioned by the company and made under the guidance of an engineer.

This photo was taken from the hill in front of the viaduct, above the engine room in the third plane, at a point corresponding to the beginning of the curve, which allows us to see the projected curve as well as the viaduct columns. The same is observed in the *Túnel da Cachoeira* and *Alto da Serra* (maneuvering yard) photos, also with a group of workers on the line. Similar framing is observed in records of future embankements by Mogiana Company (Figure 11).

Figure 10: Augusto Militão de Azevedo. Grota Funda Viaduct (c. 1865).
Source: Collection Library Mário de Andrade, São Paulo, SP, Brazil.

A second example of artistic-technical interface are the architecture registries; i.e. there is probably an artistic perspective in the framing of the photos of constructed buildings. Image framing is often times performed with the camera close to the ground focusing on two escape points. It is a classic perspective in pictorial views, which was equally familiar to the training of engineers, for use in the final representation of the project (Figure 12).

Records of buildings (stations, warehouses, maintenance workshops, supply material storerooms) are usually made that way. What calls our attention is that the photos of stations have wide field of view. In the collection we studied there are representative series of this framework – including in São Paulo State Railway album with photos of the stations in the core. Produced with a view by the line, the framing allows us to visualize the passenger building and the annexes, as well as the yard for maneuvers and cargo warehouses. There is a set of images of the stations in the Mogiana Company Album – Buildings (1910) made by photographer O. Laniati (Figure 13) – both of the main trunk and small branches, including the extension to Minas Gerais – designed in this formal pattern. On the platform, it is possible to identify not only the station master, but also warehouse loaders and track maintenance workers; beyond the station yard, with parked wagons. An identical pattern was observed in the images of Militão de Azevedo in 1868, on the stations of Rio Grande, São Bernardo, São Paulo, the station yard and workshops, suggesting the interest of the company's

Figure 11: Embankment at Tambaú-Bento Quirino branch line, cutting 35, Km 230. Mogiana Company. Unknown author.
Source: Museu da Companhia Paulista (Jundiaí, SP, Brasil).

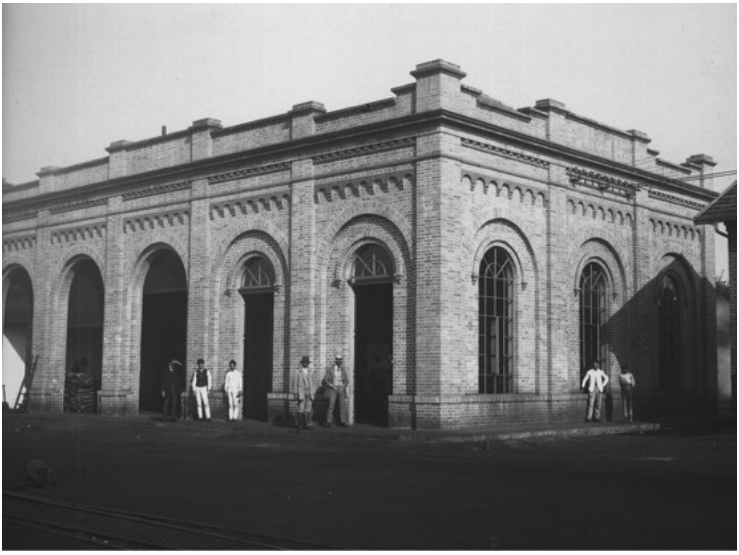

Figure 12: Power plant in Ribeirão Preto. Mogiana Company. Unknown author.
Source: Museu da Companhia Paulista (Jundiaí, SP, Brasil).

Figure 13: Mococa station [SP]. Mococa branch. Mogiana Company. 1910. Author: O. Laniati.
Source: Museu da Companhia Paulista (Jundiaí, SP, Brasil).

administration to register cargo and passenger transport operations and not simply the building itself.

Conclusion

In general, the text sought to report the overall reasons and guidelines for how the photographs were produced to record railways in São Paulo. From the very beginning we claim that, in view of the volume of material still available in collections, photographic records were not isolated cases of a specific company, especially in Brazil. The construction of public and transportation works were opportunities for a growing number of photographers from the mid-19th Century in France, England, the United States, Spain and other countries. Not simply as photographic records to be commercialized to the general public, but by direct demand of the construction engineers who recognized possibilities to apply photographic techniques (daguerreotype, stereoscopic or photograph) for the inspection of construction works or illustration of construction techniques. São Paulo railway photographic collections, although they are few compared to international collections, can exemplify some of the purposes, recorded themes or formal aspects of the images: conceived as construction registries (in progress or completed) aimed at rendering accounts to the commission responsible for the construction or a department of the company (especially foreign capital companies, whose designers or sections were located in another country).

Furthermore, the most relevant component in these photographic records is the consolidation of a rational look at the production of these images – concomitant with other visual references that including images also present in these collections or produced by the same photographers. It is the predominance of the engineer as a privileged observer, not only as a reader of the image or "client", but of the knowledge and engineering practices at the time as a direct stakeholder in the composition of the photographs. At first, the demands for inspection of the activities justify registration at certain times of construction. Then, for construction or administration, the engineer chooses the construction and structures to be photographed (track beds, landslides, embankments, bridges and buildings). Finally, topographical and axiometric requirements propose adjustments in the positioning of the camera, in the framing of the construction work, in the composition of the space. In summary, the iconographic documentation listed throughout this article demonstrates how the photographic record of railway engineering established visual standards grounded in engineering science.

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Notas

1 In October 2016, we found a copy of *The Great Southern Railway* album at the library of the Polytechnic School of the University of São Paulo, with a Casa Ferrez logo and *pass-partout* identical to those of the other albums. The material was catalogued for decades as a photography album and no mention to the photographer. However, when we investigated, all of the photos had been cut and stolen from the album. Only the album cover was left on the shelf. The crime had been found months before, according to information provided by the library.

2 A photographic registry is demanded during civil engineering construction, according to technical instructions provided by the Brazilian Institute of Public Construction Auditing (Instituto Brasileiro de Auditoria de Obras Públicas) (OT–IBR 003/2011), and to legal requirements for auditing, inspection of public construction reports – i.e. local and federal legislation to issue a construction license. SÃO PAULO. Municipal Decree 27, 57.776/2017, art. 22. SANTA CATARINA. Course on Public Construction TR/SC. Florianópolis: TR/SC, 2008, p. 57. Available at: < https://sigep.sea.sc.gov.br/downloads_upload/1248459123.pdf>. Access on March 25, 2018, BRAZIL. Public Construction. 4ª ed. Brasília: General Secretary of External Control, 2014. Available at < http://portal.tcu.gov.br/biblioteca-digital/obras-publicas-recomendacoes-basicas-para-a-contratacao-e-fiscalizacao-de-obras-e-edificacoes-publicas.htm>. Access on March 25, 2018

3 This text by Barbosa, Medeiros & Ghedhill (2010) attributes images to the Australian photographer Edward Haigh. However, references indicate that he went to London in 1861, where he set up a studio (Moura & Haigh) and worked until 1872. Different business cards produced by the studio between 1863 and 1867 are part of the National Portrait Galley (London) collection. There is no registry that Haigh travelled to Brazil. However, we found this information on a collection of the São Paulo Railway photographs dated 1868, which belonged to Haigh's study, but whose negatives belonged to Daniel Michael Fox ("Photographs S.P. R'way/Moira & Haigh / 1 Lower Seymour St. Portman Square / negatives belonging to D.M.F.").

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