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And, finally, to my friends. Thanks for hanging around.

Introduction

A jpeg of Gilbert Stuart's famous *George Washington* portrait (Figure 0.1) has been dragged from Google onto my desktop as "*download.jpg.*" (Figure 0.2) Clicking on the icon conjures a larger version in Apple's *Preview* program, which, beyond viewing the image's dimension in pixels, allows me to edit the scale, color, and background of Washington's likeness. The digital image copied from the internet is mine to manipulate. When I open *download.jpg* as a file in a text editor, however, the image completely dissolves from the screen. Instead, George Washington's likeness transforms into an indecipherable code; swaths of paint are substituted for lines of letters, numbers, symbols, and punctuation. "ì‡Qú8Â7+E vrÛK ÀÎyß*ƒ*ñ6VÌw¥iÕ«';aÊ| ˝Øk,®öyï˜Ÿ c:1ågR," anyone? (Figure 0.3)[1]. Whether made on the computer, uploaded, or scanned, digital images are stored and transmitted across the world's screens instantaneously. As *download.jpg*'s coded textuality makes clear, the viewing of digital images does not require the perception of the many layers operating beyond the immediate interface. If anything, digital images naturally instantiate themselves as completely indifferent to the code, labor, and various materials that lie beneath their pixelated surfaces.

Images are traditionally phenomenological objects that can only be viewed through our sense of sight; images *exist* only when the eye is able to perceive them. Digital images, as my example shows, exist in their totality as sets of data, merely coordinate points free from a visual plane. Computer graphics exist, therefore, prior to their instantiation in and as a given image.[2] As media theorist Friedrich Kittler notes in his lectures on optical media, "computers must calculate all optical or acoustic data on their own precisely because they are born dimensionless and thus imageless. For this reason, images on computer monitors […] do not reproduce any extant things, surfaces, or spaces at all. They emerge on the surface of the monitor through the application of mathematical systems of equations."[3] While mimetically the same as images portrayed on tactile surfaces, computer graphics operate differently than those of painting, printing, camera, and film. In simulating an image, the very material basis - that

[1] For a more radical use of this tooling, see, Hito Steyerl, "Medya: Autonomy of Images" in *Duty Free Art*. (New York: Verso, 2017)
[2] Jacob Gaboury, "Hidden Surface Problems: On the Digital Image as Material Object." *Journal of Visual Culture* 14, no. 1, (April 2015), 40–60.
[3] Friedrich Kittler, *Optical Media : Berlin Lectures 1999*, (Cambridge, UK ; Malden, MA: Polity Press, 2010.)

which lies beneath the surface of the screen - is largely forgotten. Contrasting early philosophies that equated vision and truth, digital images are the ultimate surface sham.

Digital images break the contract of empirical perspective through their virtual simulation. As William Ivins describes in the *Rationalization of Sight*, perspective is merely a "means for securing a rigorous two-way, or reciprocal, metrical relationship between the shapes of objects as definitely located in space and their representations."[4] *Download.jpg* is thus simulated on my desktop much like Gilbert Stuart's *Washington* is hung on the walls of the Boston Athenaeum, but has a completely different ontological existence in space and time. *Download.jpg* seems totally opposed to other tactile iterations of Stuart's portrait. The surface effects of d*ownload.jpg's* pictorial mechanisms - its virtual composition, coded textuality, and pictorial becoming - are hidden from sensorial perception, completely removed from the human's ability to see and know. Moreover, while we can attest that the digital graphic was at one point a painting, the image exists entirely removed from earlier iterations. The viewer cannot immediately tell what camera was used to scan the image, the labor it took to make the image, nor the data necessary to keep it accessible on Google. The surface of digital images betrays perception and the varied history of the image. Out of sight and out of mind, the digital image presents itself as an object for our use without regarding its own history of making.

The operands surrounding the material making of *download.jpg* began long before computers were actualized. Although there was no such thing as a computer image in the mid-nineteenth century, images could, in fact, exist beyond their actualization on a tactile surface. No longer optical, they were digital representations. My choice to download Gilbert Stuart's *Washington* was intentional, for the beginning of these screen tactics and the re-negotiation between surfaces and epistemic modes of knowing were brokered upon the making of a peculiar copy of the nation's forefather. Created in 1851 by a Messrs. *Ponson, Philippe, & Vilbert* for an American ambassador, the image (Figure 0.4) seems an almost near perfect copy of a print of Stuart's *Washington* (Figure 0.5) or perhaps even a Daguerreotype copy of the original painting. The object, however, is not made from paper or canvas or glass. The image does not sit upon its material substrate; the image and object are one and the same. Not painted, not printed, nor photographed -- the image is made of silk threads and was woven upon a Jacquard loom.

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[4] William Ivins, *On the Rationalization of Sight, with an Examination of Three Renaissance Texts on Perspective, (*Da Capo Press, 1973.)

Invented sometime at the beginning of the nineteenth century by Joseph Marie Jacquard in Lyons, France, the Jacquard Loom revolutionized weaving: simultaneously making the laborious process much faster as well as enabling a new visual definition. The Jacquard loom, or, rather, the Jacquard harness, was a device that automated the raising of warp threads of the loom between each passage of the horizontal weft thread. The automation of the loom was controlled by a system of interlaced pasteboard punch cards. Holes were punched on each card corresponding to a particular alignment of the warp rod, during a single passage of the horizontal shuttle. Once energy was applied, the perforated cards were drawn along a constantly rotating metal box. The cards were bisected and 'read' by needles connected to the rods controlling vertical warp threads. The needles that lined up with the card's punched holes would fall, shifting the corresponding rods and their threads to the "on" position. The other rods, those whose needles bisected the part of the card without any perforation, remained in the "off" position.[5] The Jacquard loom was thus a machine for reading and translating *optical* data through the use of binary code.

Historians of the digital world have long acknowledged the Jacquard loom as the beginning of the computer's history. There is often, however, an impulse to reduce the importance of the Jacquard loom as one of the plethora of technologies that were used to merely create the computer. As the accepted history proceeds, binary punch cards of the loom inspired Ada Lovelace and Charles Babbage to dream up Analytical Engine, which would algebraically "weave patterns as the Jacquard Loom weaves flowers and leaves."[6] Babbage's Analytical Engine was never built, but was eventually actualized by American Herman Hollerith for the census calculation machine and then used throughout the twentieth century for the International Business Machine Corporation. Unlike the Jacquard loom, these calculation machines crunched numerical data without any optical output. The computational image was disregarded until cathode ray tubes were standardized for computer displays in the 1950s, thereby synthesizing numerical data into an easily manipulatable optical image for screen display.

The empire of sight therefore continued its reign once calculation was able to simulate images in the late twentieth century. As Lev Manovich writes, "before, the computer could read a row of numbers, outputting a statistical result. Now it can read pixel values, blurring the image, adjusting its contrast, or checking whether it

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[5] Stephen Monteiro, *The Fabric of Interface : Mobile Media, Design, and Gender*, (Cambridge, Massachusetts: The MIT Press, 2017.)

[6] Quote found in James Essinger, *Ada's Algorithm : How Lord Byron's Daughter Ada Lovelace Launched the Digital Age*, (Brooklyn: Melville House, 2014.)

contains an outline of an object [...] In a historical loop, the computer has returned to its origins. No longer just an Analytical Engine, suitable only for crunching numbers, it has become Jacquard's loom - a media synthesizer and manipulator."[7] Referring to the Jacquard Loom as a media synthesizer and manipulator is an accurate way to describe its position in the production, transmission, and reception of images within the nineteenth-century media ecology. Images during the nineteenth century, according to Foucault, "circulated rapidly between camera and easel, between canvas and plate and paper… and came a new freedom of transposition, displacement, and transformation, of resemblance and dissimulation, of reproduction, duplication, and trickery of effect."[8] As floating substances no longer static due to the advent of the lithography and photography, pictures were transported, or, perhaps more accurately, 'copy-pasted,' across flat surfaces in a never before seen scale. The copy-paste sentiment was explicated best by the first philosopher of photography, Oliver Wendell Holmes. In his now infamous *Atlantic Weekly* explication, Holmes announced that form was quickly becoming "divorced from matter." Once natural forms had been scaled from their surfaces, rendered cheap and transportable, matter was a burdensome bi-product meant to be "pulled down and burned."[9] Yet, as we will see, images' movements in and across different mediums was always explicitly material.

It is no surprise that the woven image chosen was of America's founding father. As one of America's most well known visual icons, Stuart's *Washington* has been edited, copied, stored, and transmitted across many material surfaces throughout its 200 year life. Painted for the explicit purpose of later reproductions, held safely in museums, and now printed on every one dollar bill: Stuart's *Washington* is an tactile picture that has remained a key image in America's visual lexicon since its creation. Simply put, it is the nation's *original* copy. The woven iteration was first copied into print by Thomas B. Welch with the help of a Southworth & Hawes Daguerreotype in 1851 (Figure 0.6). Published by George W. Childs in 1852 and transported across the Atlantic ocean by a Philadelphian ambassador to Lyon, France, the image was then translated into a binary code and woven by Messrs. *Ponson, Philippe, & Vilbert* in 1855. Finally, much like the historical loop of digital images referenced by Manovich, the image-object of *Washington* woven in threads was returned home and given to the cities of Boston, Philadelphia, and New York.

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[7] Lev Manovich, *The Language of New Media*, (Cambridge, Mass.: MIT Press, 2001.)
[8] Michel Foucault, "Photogenic Painting," in Gilles Deleuze and Michel Foucault, Gerard Fromanger: Photogenic Painting, (London: Black Dog Publishing, 1999.)
[9] Oliver Wendell Holmes, "The Stereoscope and the Stereograph," *Atlantic Monthly*, June 1859, 737.

The Jacquard portrait of *George Washington*, a copy of a copy, exemplifies how the Jacquard loom was arguably the most important image-synthesizer for the many methods of reproduction in the transatlantic media ecology of the nineteenth century.

Unlike the digital image, however, the Jacquard woven portrait was subject to the inability of transporting images synchronically. Although new communications technologies gestured towards an "annihilation of space" fitting for our contemporary virtual world, images in the nineteenth century were manipulated through distinct mechanical maneuvers, physically transmitted across vast expanses of land, and viewed within defined cultural infrastructures.[10] Form was becoming 'divorced from matter' due to the sheer amount of images produced, but still beholden to the image's materiality. For example, the telegraph had time-altering effects on language at mid-century, yet images were resistant to the technologies that altered the emerging telecommunications network between the transatlantic world. Paintings, photographs, prints, and Jacquard-woven portraits were resistant to the codes that enabled safe passageway through cables and across oceans. Indeed, images were still bound to their flattened picture planes as Holmes dreamed of pictures flying off into virtuality.

In tracing the history of a Jacquard-woven image of Stuart's *George Washington* throughout transnational borders and parallel modes of replication, this thesis illustrates how images in the nineteenth-century Atlantic world could, in fact, exist precisely because of a code that bellied their making. While the Jacquard loom's instrumentalization in engendering the digital world of binary computation has been accurately documented, the discreet images produced and their legacy within art's mediated history has largely been ignored. Woven images in the nineteenth century are therefore an integral part of the historical epistemology of reproductive images precisely for what their surface does not reveal: the method, history, and labor of their making. Much as *download.jpgs's* textuality is invisible to the human eye, viewers of the Jacquard-woven portrait processed the silken image without acknowledging the various techniques of its production. Yet, the materiality of the silk ultimately delayed the image's own potential for synchronic transmission. In paying attention to each iteration of the image's materiality, maneuvers across surfaces, and physical transmission across land, the woven *Washington*'s unique history reveals its own reliance upon and entrapment within the media ecology of nineteenth century. An object before its time, the

[10] Jennifer L.Roberts,, *Transporting Visions : The Movement of Images in Early America*. (Berkeley: University of California Press, 2014.)

woven image presents itself as case study for understanding how media history and art history often exist in parallel lines.

Each chapter illustrates how the Jacquard-woven portrait of *Washington* was reliant upon another mode of mass reproduction for its making. Chapter 1 takes binary thinking as a methodological nexus for two seemingly medium-specific reproductive processes, photography and weaving, to postulate that the *negative* was a reproductive *space* for artisans and inventors interested in having images transcended stable definitions, practices, and materials. Further, it was precisely the negative's depraved status - as a non-image, or in-between image - which allowed its frequent manipulation and application to a diverse set of reproductive making practices. This chapter therefore operates between the space of binaries, while still asserting their epistemic potential and importance in the making of images in the nineteenth-century media ecology. Chapter 2 traces the historic translation from an intaglio copper engraving to a punch-card code, but stresses how this translation process visually afforded the displacement of craft labor. What I suggest is key to understanding these divergent practices of reproduction, one engaged with pressing ink and the other in weaving silk, is their respective reliance upon the cultural technique of the *gridded matrix* in the preparation of the image for translation. Both processes relied upon the grid to visually structure and mechanically reproduce George Washington's likeness, but their respective manipulations are key to understanding how the conflation between print and Jacquard-woven image ultimately fails. Chapter 3 analyzes the woven portrait's relationship to the cultural assumptions surrounding fabric in the nineteenth-century media ecology, while simultaneously framing the object's synchronic possibility and material recalcitrance. While the code-image of the *Washington* could have altered space and time through the telegraph, it was ultimately belabored by its silkenness. This antagonism, between fine silk and slow speed, reveals that the woven image was framed as a work of fine art and not of mass reproduction.

Underlying my observation is a key reliance upon the interrelated, but all-too often forgotten, relationship between the creation and alteration of surfaces of meaning through threads at the visual, material, symbolic, and informatic level. If the nineteenth century ushered in Modernism's fracturing of the signifier in communication, it relied upon the material, metaphoric, and infrastructural dynamics provided by the thread. In the case of the Jacquard loom, threaded intelligence was coupled with boolean logic to create a epistemic shift in both how images were projected *into* materials, and, much later, how they themselves were transported as objects. The making of this

object in threads not only gestures towards the software of the computer age but the hardware of the cables, wiring, and circuitry of our current computerized systems. Beyond merely narrating a history of an object's production, transmission, and reception through varied modes of reproduction, I assert that the Jacquard loom was a media synthesizer that is not only important to the history of digital images, but to the history of American Art.

Figures.

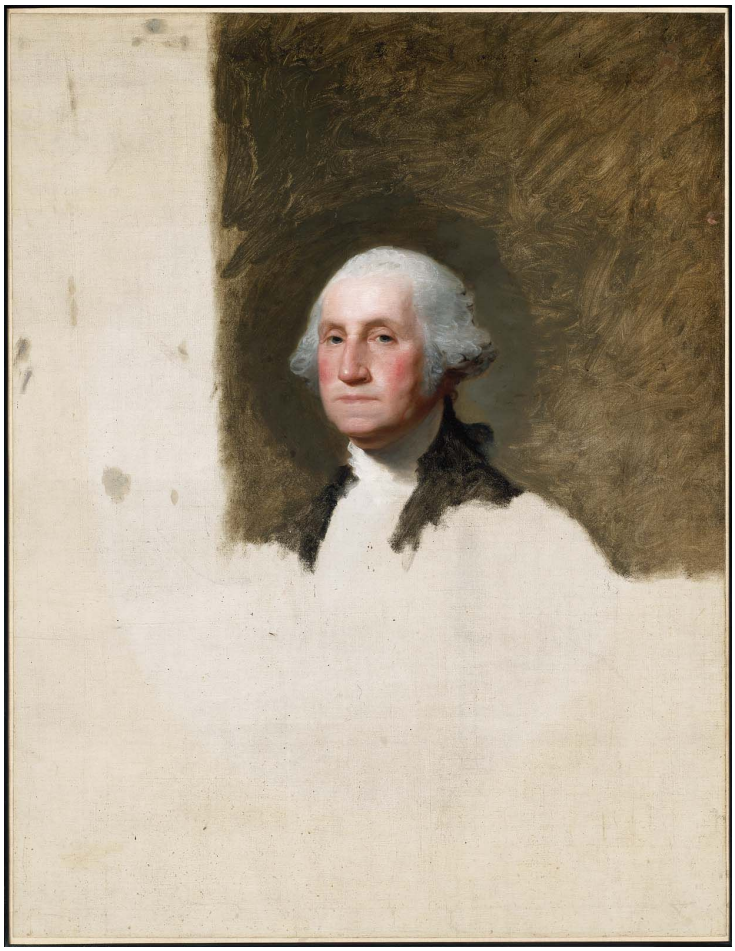

Figure 0.1. Gilbert Stuart. *George Washington*, Oil on Canvas, 1796. Boston Museum of Fine Art.

Figure 0.2. *download.jpg*

Figure 0.3. *Download.jpg* in Apple's *TextEdit*

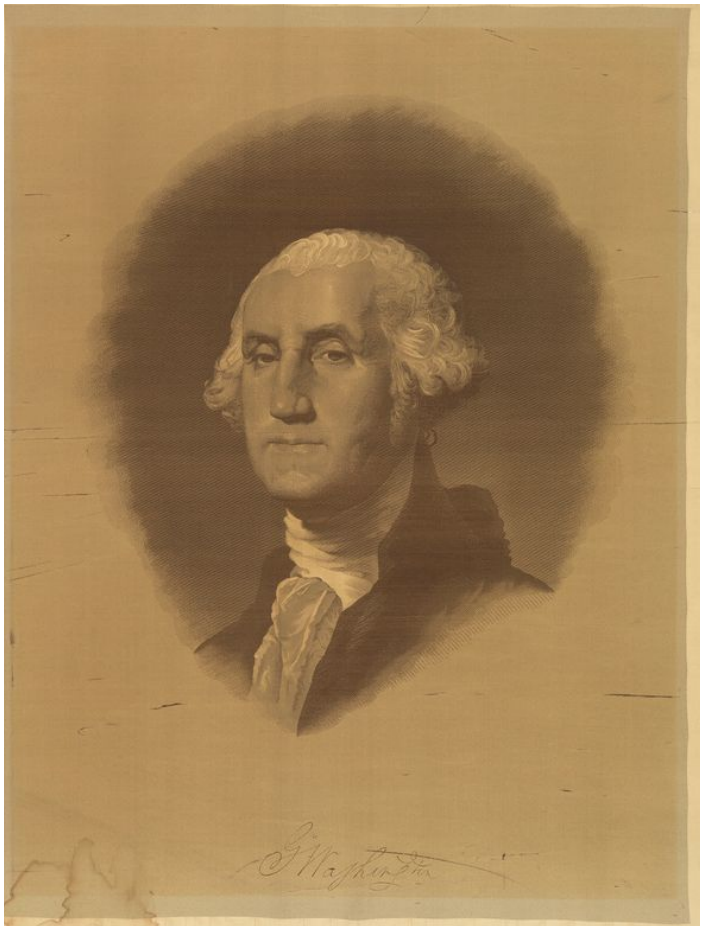

Figure 0.4 Messrs. Ponson, Philippe, & Vilbert. Jacquard-Woven Portrait of George Washington, 1855-59. Brown University Libraries.

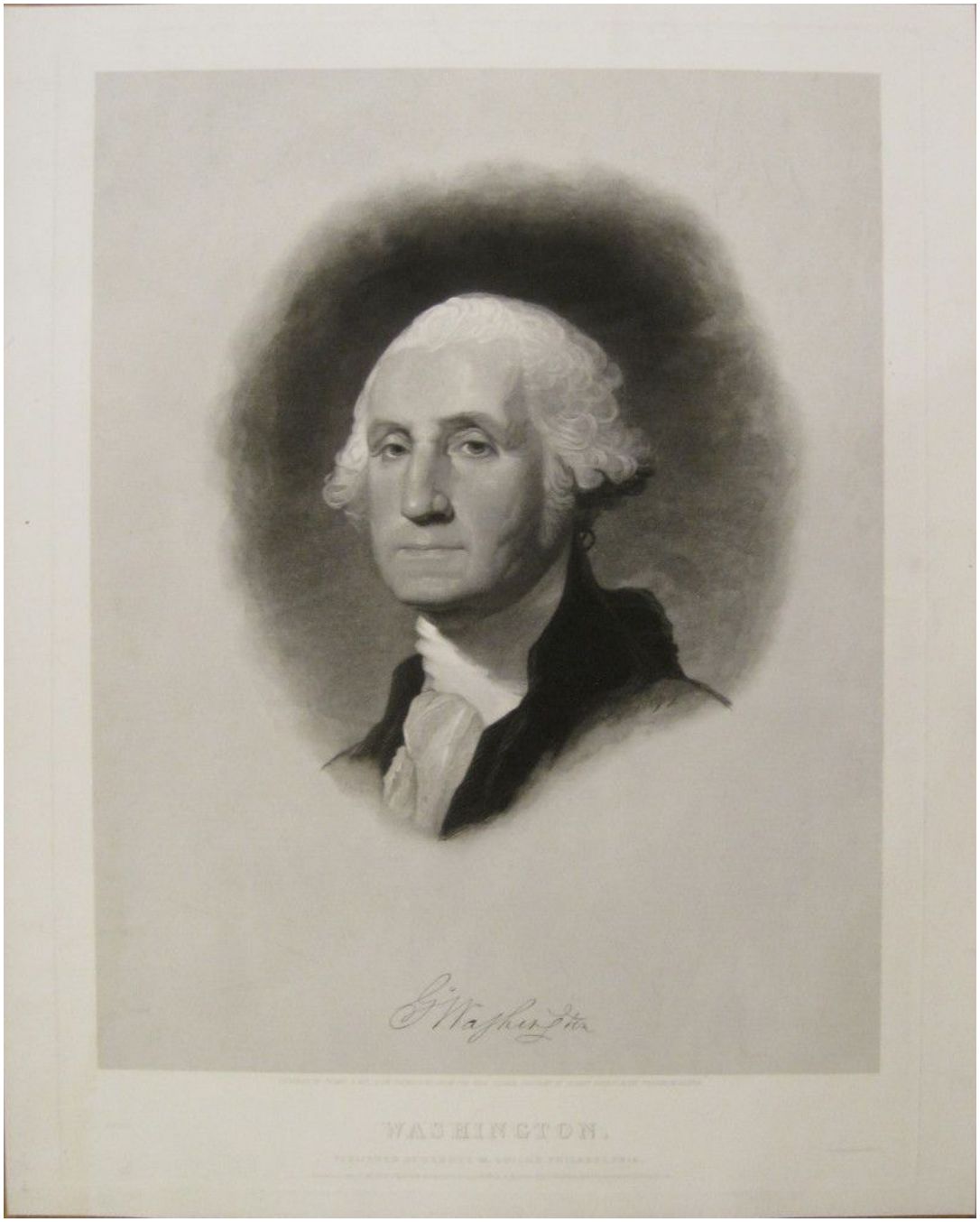

Figure 0.5. Engraving by Thomas B. Welch, Published by George W. Child. Printed by A.E. Lent in Philadelphia in 1852. George Washington after Gilbert Stuart. Stipple Engraving. Boston Athenaeum.

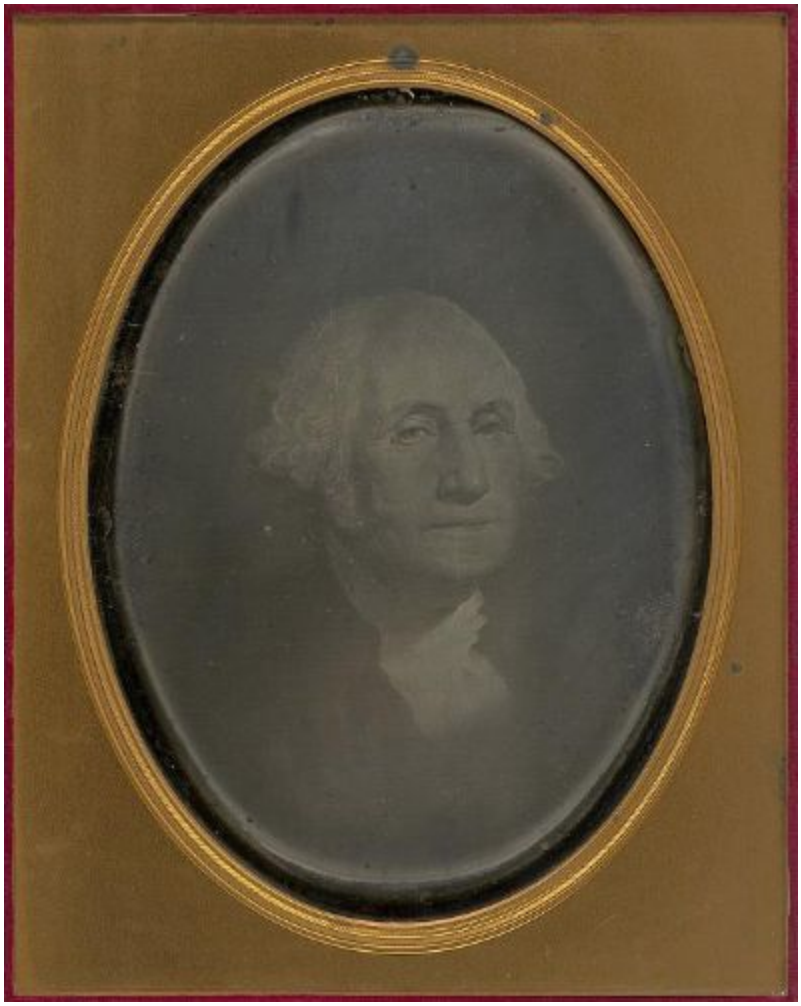

Figure 0.6. Southworth & Hawes, Copy of Gilbert Stuart's George Washington. Quarter-Plate Daguerreotype 1851.

Chapter 1

In anticipation of the Paris Exhibition in 1900, a polish-born inventor, Herr Szczepanik, declared he was able to weave, "silk pocket handkerchiefs in public." In half an hour, so said the 'Polish Edison,' a patron would "be able to walk away with a silk handkerchief with their own portrait woven *into* it."[11] To do so, Szczepanik was reliant upon connecting a cameratic apparatus to the Jacquard loom itself -- a novel integration of two separate reproductive methods for copying images. As this anecdote suggests, the turn of the century was fueled by an uncanny desire to transform a bodily presence from photograph to silken image. Oddly akin to photography, whose processes made it possible to chemically index reality, the Jacquard loom wove to index reality in threads. Despite possessing seemingly divergent processes of making, the two mediums for reproduction had similar aims in the nineteenth-century image ecology: to rapidly and accurately copy images of the self. It comes as no surprise, then, that the two might possess a more reciprocal relationship than meets the eye. Szczepanik's promise of a silk pocket handkerchief woven in under 30 minutes, for instance, exemplifies how Jacquard weaving and photographic practices were used to fascinate and quell anxieties concerned with processes of mechanical duplication, which disrupted stable notions of originality, definitions of the self, and geographic boundaries.

Beyond photography and weaving sharing a common goal in visual reproduction, both processes relied upon a binary logic - positive and negative, perforated or not-perforated - to create images. Writing at the end of the 1850s, Oliver Wendell Holmes, America's foremost philosopher of photography, tied the act of copying Nature to the photographic negative. Writing for the *Atlantic Monthly* Holmes exclaimed: "This negative is now to give birth to a positive, this mass of contradictions to assert its hidden truth in a perfect harmonious affirmation of the realities of Nature [...] Out of the perverse and totally depraved negative, where it might almost seem as if some magic and diabolic power had wrenched all things from their propertie...is to come the true end of all this series of operations, a copy of Nature in all her sweet gradations and harmonies and contrasts."[12] Holmes' methodological explanation of each step of the reproductive photographic processes, narrating a metamorphoses from the depraved negative to a positive copy of Nature, exemplifies the necessity of the negative in the copying process. Although it was often seen

[11] "Has a Magic Loom: Vienna Wizard Makes a Wonderful Discovery." *Chicago Daily Tribune*, July 24, 1898.
[12] Oliver Wendell Holmes, "The Stereoscope and the Stereograph." *Atlantic Monthly*, 3, No. 20, June, 1859.

as a state which preexisted a picture's final form, all methods of 'doings of the sunbeam,' from Daguerreotype to paper-based photography, relied on the depraved negative.[13]

That Holmes referred to positives as "true pictures" is telling of how reproductive processes' reliance upon inversion and deception produced deep anxieties about the act and status of picturing in the nineteenth century.[14] Perverse to Holmes and surely to other nineteenth-century viewers, the *negative* was the seeming opposite of natural order. Negatives were not images: they were merely a necessary, and, for Holmes, disgraceful, step in the process of reproducing 'true pictures.' Holmes' primitive tactics have seeped into the field of art history; negatives are either ignored in the process of understanding positive photographs or simply framed as reproductive intermediaries.[15] Rather than extending the negative into further depravity, I want to suggest that the negative was a productive space for artisans and craftspeople to create intermedial images. By intermedial, I mean moments where two different mediums were used simultaneously to make an image which rejects a stable classification. The negative was a productive space for images and their makers to escape the restraints of any specific medium, translate images across surfaces and into other materials, and combine processes of reproduction in the nineteenth century. This chapter therefore takes the negative as a nexus for two seemingly medium-specific reproductive processes and postulates that the negative was a reproductive *space* for artisans and inventors interested in allowing images to transcended stable definitions, practices, and materials. Further, I argue it was precisely the negative's depraved status - as a non-image, or in-between image - which allowed its frequent manipulation and application to a diverse set of making practices. Methodologically operating between the space of binaries, this chapter asserts the negative's epistemic potential and importance in the making of images in the nineteenth-century media ecology.

Bridging the shift between the popularity of Daguerreotypes in the 1850s and the complete takeover of photomechanical processes of the early 1900s are two distinct moments of intermedial interaction which reveal the instability of seemingly separate media categories in the long nineteenth century: a Daguerreotype used to mobilize an Gilbert Stuart's *George Washington* for synthesis on the Jacquard loom, and later, the integration of photographic processes into the Jacquard loom's operating system. Though seemingly disparate in their chronology and use of the

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[13] Oliver Wendell Holmes, "Doings of the Sunbeam." *Atlantic Monthly*, July 12th, 1863, 1–15.
[14] Holmes, "The Stereoscope and the Stereograph." *Atlantic Monthly, 1859.*
[15] One exception would be Darcy Grimaldo Grigsby's excellent, "Negative-Positive Truths." *Representations*, 113, no. 1, 2011, 16-38.

photographic practice, each episode reveals the negative as a strategy for media integration in the nineteenth century. In each of these narratives, the negative's involvement in connecting the Jacquard loom and photographic processes illustrates a historically grounded relationship between practices of photography and practices of weaving across time and space within the nineteenth century. The negative, the inversion of the true picture, was therefore the productive space for reproduction, translation, and transformation of images that allowed craftspeople to think through broader implications of copying and dematerialization.

Photography is arguably the most manipulatable and accessible medium of making reproductive images in the contemporary moment. The procedures of digital photography began with the productive interchanges of reproductive media in the 1800s. The efforts of inventors in developing a working relationship between practices of weaving and photography provides a historic precedent for today's digital world where photography relies upon threads of binary code quite literally *woven together*. Without collapsing the contemporary onto the nineteenth century, the negotiation of the digital portrait today bears a strong resemblance to the desire to escape material specificity in the nineteenth century. Portrait making lent itself to the introduction of intermedial technologies, paving the way for the synthesis of new media for representation. Expanding the static historiographic understanding of both photography and Jacquard weaving, I suggest we turn our attention to how the photographic tooling and photographic aesthetics mediated through the negative simultaneously made their way into, out of, and onto the Jacquard weaving processes in the nineteenth century. As we will see, the desire to make a portrait in silk *was* the reason to combine forms of reproductive media through the logic of the negative.

Tilting Negatives

The origin of the woven portrait begins in Boston, where the Philadelphian engraver, Thomas B. Welch, arrived at the Atheneum to copy Gilbert Stuart's original painting of *George Washington* in 1851. By this moment in American artistic production, the act of copying great American works of art was commonplace. Welch joined a host of engravers, painters, and sculptors reproducing works of art for the masses. Copies of portraits relied upon their materials and verbal framing devices to tether them to their original bodies, combining the making of an iconic image to the making of many multiples. Welch was one of many engravers to join in a chain of replication and circulation that destabilized originality while creating the iconicity of Stuart's *Washington*. According to a facsimile

production of the engraving (Figure 1.1), Welch "stood honestly and with permission in front of the *only* original portrait by Gilbert Stuart in the Boston Athenaeum."[16] Copying from the original painting signaled a sense of authenticity and artistic prowess to the print's scattered potential consumers. The *act* of copying, or the feedback loop between the copier's hand and the original painting of *George Washington,* was crucial to the print's returns on the market. Note that the presence of the artist's hand was equally important as the visual veracity of the copy itself: the copy indexed originality by the engraver's phenomenological presence with the portrait.

Despite their inscriptions, prints were deceptive of their sources in the nineteenth-century American image economy. The stipple-engraved replica by Welch was, in fact, *not* copied from Stuart's original painting. The print patently lied to consumers. Welch certainly travelled to the Boston Athenaeum in 1851 to faithfully reproduce the 1786 painting, but rather than engaging faithfully, Welch used Daguerreotype copies of Stuart's painting produced by Boston photographers, Southworth & Hawes, as his guide to aid in reproduction. According to an article in the December 16th, 1852 edition of the *Boston Transcript*, Welch utilized the uniquely reversed images of the Daguerreotyped *Washington*. By using the Daguerreian "new apparatus for enlarging and tracing upon transparent paper… a copy of the exact size of his intended picture"[17] was procured for Welch's purposes (Figure 1.2).

The act of copying a work of art through Daguerreotype, often used for portraits, was certainly uncommon. Nevertheless, as Sarah Gillespie has argued succinctly, the use of the Daguerreotype for copying works of art burgeoned among artistic circles in the 1850s.[18] The beginning of this popular practice, which quite literally removed the work of Art from its physical space, was often enacted upon sculpture. For instance, a Daguerreotype of Hiram Powers' *Greek Slave* (Figure 1.3) captures brilliantly the tones and shadows created by the material depth of the sculpture itself. A quote in the *Bulletin of the American Art Union* makes it clear that fine art and the Daguerreotype possessed a satisfactory working relationship: "There is one use of this discovery which strikes us as being exceedingly valuable...its power of representing great objects of art."[19] Matthew Brady, a now famous figure

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[16] The print reads: "Engraved by Thomas B. Welch by permission from the only original portrait by Gilbert Stuart in the Athenaeum Boston, Washington, Published by George W. Childs Philadelphia, Entered according to the Act of Congress in the year 1852 by George W. Childs in the Clerk's Office of the Eastern District of Pennsylvania."

[17] Comment made by an Anonymous Reviewer in the *Boston Evening Transcript*, December 16th, 1852. Courtesy of Boston Athenaeum.

[18] Sarah Kate Gillespie, *The Early American Daguerreotype : Cross-Currents in Art and Technology*, (Cambridge,Massachusetts : MIT Press ; Washington, DC : The Lemelson Center, Smithsonian Institution, 2015.)

[19] "The Daguerreotype," *Bulletin of the American Art-Union,* 1, November, 1850. 181-182.

in American photography, echoed this sentiment: "In the Department arranged for Copying Engravings, Painting, Statuary, the light and instruments have been expressly designed for this purpose."[20] The tonality of Daguerreotypes, their ability to positively capture light and negatively illustrate shadow, instilled artworks for private, yet uniquely technological, viewing experiences. As a medium for copying and recording pictures, the Daguerreotype enabled America's burgeoning populace to see previously static works of Art.

It is tempting to stop here. Daguerreotypes, however, aided in the proliferation of art objects through other channels beyond their visual appeal. The act of translating a Daguerreotype to stipple engraving deserves attention for it illustrates how *negativity* structured Welch's reproduction process. There is a prevailing notion that Daguerreotypes were somehow resistant to mechanical replication in the nineteenth century. For example, Alan Trachtenberg postulates that the Daguerreotype had, "qualities of brilliance, vividness and presence... as a one-of-a-kind image produced directly on the plate, without the mediation of a negative, the Daguerreotype defied mass production; it possessed the aura of a unique thing."[21] The shift between between the Daguerreotype and paper-based photographic practices relied upon the intermediary negative. This fact, however, does not mean Daguerreotypes were separated from negativity. If anything, Daguerreotypes held the negative closer to their material substrate and enforced its phenomenological presence within the culture of viewing during the mid-nineteenth century. As one viewer described, from "the merest tilt of the plate, the actual image seems to flicker away, then reappears in negatively reversed tones, making the portrayed sitter look literally like a shade or shadow of himself or herself."[22] Negatives embedded within the Daguerreotypes' doppelganger matrix of tonality therefore challenged the stable status of a sitter's own image, literally deceiving the perception of the self through a silvered surface.

Trachenburg was right to assert that Daguerreotypes captivated audiences by indexically and materially solidifying originality throughout the 1840s. Not only did Daguerreotypes possess an unquestionable general fidelity to an original moment in time, but as uniquely reversed images without intermediary negatives, the only way to

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[20] *Bulletin of the American Art-Union,* 1, November, 1850. 45. Advertisement found in Sarah Kate Gillespie, *The Early American Daguerreotype.* (2015).

[21] Alan Trachtenberg, "Photography: The Emergence of a Keyword," in *Photography in Nineteenth-Century America,* ed. Martha Sandweiss (New York: Abrams, 1991), 17-45.

[22] "The Inconstant Daguerreotype," *Harper's Monthly*, 10, May, 1855, 824. Referenced in Alan Trachtenberg, "Photography: The Emergence of a Keyword" in *Photography in Nineteenth-Century America* (1991).

properly reproduce them was to re-photograph their surfaces. The stringent, metallic materiality of each image demanded a negative feedback loop between its own making process. The reproductive potential of the Daguerreotype, however, was extended when photographers Southworth & Hawes began profiting off the Daguerreotype's unique ability to *reverse* images laterally. The Daguerreotype's seeming negativity, its *original* nature, was paradoxically the exact tooling used for its reproduction in different mediums.

Southworth & Hawes, the photographers of Gilbert Stuart's *George Washington*, were one of the most proactive practitioners using Daguerreotypes to aid in the reproduction of original works of art. As some of the first professional photographers in the country, Southworth & Hawes are well known within the history of photography for their artistic Daguerreotypes of mid-century Bostonians. Previous categorizations of Southworth & Hawes highlight their involvement in a Daggeuroian mode associated with originality; instead, to bring attention to their involvement with mechanical reproduction, I want to draw attention to their Daguerreotypes of artworks in the Boston Athenaeum.[23] Southworth & Hawes more than prided themselves on the faithful reproduction of original artwork. The pair advertised to engravers that, "[they] can be of great service. We reduce pictures upon the engraver's copper or steel plate, at the same time furnishing an extant duplicate, and he cuts upon the lines made by the Daguerreotype."[24] Directly applying development liquid onto the engraving plate allowed Southworth & Hawes to transform Gilbert Stuart's painting into a Daguerreotype set atop an copper engraving plate, thereby enabling Thomas Welch to trace the Daguerreotype's negative reversal with a burin. Indeed, Southworth & Hawes' manipulation of the negative qualities of the Daguerreotype made it possible for Thomas Welch to more readily copy Stuart's *Washington* for a print-based life.

This process is exemplified in a now-lost book of engravings of Washington Allston's paintings engraved by John and Seth Wells Cheney.[25] Southworth & Hawes described the process of reducing the size of portraits upon an engraving block: "Where it was necessary to reduce the sizes of the sketches for engraving, the Daguerreotype was used, by which the image was conveyed to the engraver's plates, prepared for that purpose, and there fixed by

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[23] For information regarding the life of Southworth & Hawes, see: Odette M. Appel-Heyne, Charles R. Moore, and Robert A. Sobiesze, *The Daguerreotypes of Southworth & Hawes*. (New York: Dover Publications, 1980) and Grant B. Romer and Brian Wallis, *Young America : The Daguerreotypes of Southworth & Hawes*. (New York: George Eastman House, 2005).
[24] Quote found in Charles Leroy Moore, *Two Partners in Boston: The Careers and Daguerian Artistry of Albert Southworth and Josiah Hawes.* PhD Dissertation, University of Michigan, 1975.
[25] Sarah Kate Gillespie, *The Early American Daguerreotype : Cross-Currents in Art and Technology.*

tracing the line *through* the silver."[26] Southworth & Hawes made the Daguerreotype atop a copper engraving, and then the Cheney Brothers engraved directly upon the chemical image, "from which impressions were subsequently made."[27] While a news article details this practice as using, "a new apparatus for enlarging and tracing upon transparent paper… a copy of the exact size of his intended picture," it was likely a Dallmeyer lens that enabled Southworth & Hawes to rescale images through their Daguerreotypian apparatus.[28] Writing before his death, Hawes wrote: "The somewhat celebrated combination of lenses called the Dallmeyer lens, I made and used fifteen years before it was known under its present name." In the same letter Hawes confirmed that this re-scaling method was, "used for copying Washington Allston's sketches on copper plates sufficiently silvered *and the paintings of Gilbert Stuart*."[29] The Dallmeyer lens, named for its inventor, British photographer Thomas Dallmeyer, was developed in the later half of the nineteenth century. In a lecture describing his invention, which he referred to a 'telephotographic lens,' Dallmeyer called attention, "to the *scale* in which objects are reproduced by ordinary photographic lenses, and to show how this image may be subjected to direct enlargement...before it is received on the photographic plate."[30] In sum, the Dallmeyer lens allowed Southworth & Hawes to scale down and laterally reverse Gilbert Stuart's *Washington* across the copper plate, eventually allowing Welch to engrave in a proportionally accurate scale. The *negative* feedback loop of the Daguerreotype, that which made it so original in nature, was thus used for the translation and reproduction of Stuart's painting into Welch's engraving.

Rejecting Positivity

Although this intermedial episode exemplifies how the Daguerreotype was used as a tool for reproduction, the Daguerreotype was often considered of equal artistic value to paintings themselves.[31] Daguerreotypes were artistic originals and not degraded copies. Yet, when viewers of the print found that Welch was aided in his

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[26] Josiah Johnson Hawes, "Stray Leaves from the Diary of the Oldest Professional Photographer in the World," *Photo Era: The American Journal of Photography, 16:2,* February, 1906. 104-107. Found in the Gary W. Ewer, ed., *The Daguerreotype: an Archive of Source Texts, Graphics, and Ephemera,* http://www.daguerreotypearchive.org.

[27] Ibid

[28] Comment made by an Anonymous Reviewer in the *Boston Evening Transcript*, December 16th, 1852.

[29] Josiah Johnson Hawes, "Stray Leaves from the Diary of the Oldest Professional Photographer in the World," 1906.

[30] Thomas Rudolphus Dallmeyer, T*elephotography: an Elementary Treatise On the Construction And Application of the Telephotographic Lens.* (London: W. Heinemann, 1899.)

[31] Comment made by an Anonymous Reviewer in the *Boston Evening Transcript*, December 16th, 1852. Courtesy of Boston Athenaeum. The Anonymous Reviewer noted the President and librarian of the Boston Athenaeum saw the Daguerreotypes as being equal to the original.

reproductive processes, the originality of the print was retracted. An unnamed author in the *Boston Transcript* chastised Thomas Welch and the publisher of the print, George W. Childs, stating, "It would have been an act of justice, had the publishers of that engraving had appropriately recorded upon it some testimonial to Messrs. Southworth and Hawes, for services which they could not otherwise have procured, for facilities of their own invention, which could not have been elsewhere furnished, and which were earnestly and cheerfully bestowed without money or price."[32] The print lacked fidelity not because it was a degraded copy of a copy, but because it did not cite its source-image, or, in this case, its source-process. It was not that the Daguerreotype was used for easier engraving that sourced concern; rather, concern arose when the viewer of Welch's *Washington* print could not acknowledge its image's lived history. The visually illegible reversals, re-scalings, and reliance upon another medium put a sour taste in the *Boston Transcript* reviewer's mouth.

This masking of the Daguerreotype's influence becomes further obscured when we note the choice to use the method of stipple engraving. Michael Leja, in an analysis of the relationship between the Daguerreotype and printmaking, has argued that mezzotint printmakers utilized Daguerreotypes as a fortification medium in their copying practices. Mezzotint engravers found aesthetic resemblances between the matrix of presence and absence within both mediums, creating prints which *mimicked* the Daguerreotypes' unique material specificity of figuring bodies emerging from darkness into light.[33] Unlike a line engraving, which is dependent upon the interplay of surface and depth through linear arrangement, both Daguerreotype and mezzotint share an independence from linear arrangements. Using the Daguerreotype as a reproductive medium through mezzotint kept the tonal uniqueness : the photographic qualities rather than qualities of a painting.

That the tonal matrix produced through the Daguerreotype-mezzotint relationship was not chosen to translate the Southworth & Hawes Daguerreotype to print is further telling of Welch's desire to disregard the photographic qualities of Daguerreian substrate. Welch did not manipulate the tonal values afforded when engravers turned a Daguerreotype into a mezzotint; rather, Welch's engraving registers the opposite of this effect because it is a stipple engraving.[34] Whereas both a mezzotint and Daguerreotype illustrate figures appearing from the dark into the

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[32] Ibid.
[33] Michael Leja, "Fortified Images for the Masses," *Art Journal* 70, no. 4 (Winter, 2011): 61-83.
[34] According to William Spohn Baker, *American Engravers and Their Works* (Philadelphia: Gebbie & Barrie, 1875.) 175-178, Thomas B. Welch worked in both the mezzotint and stipple manner, making his choice of stipple engraving, rather than mezzotint, important. Oddly enough, he abandoned engraving and went to painting after 1860.

light, the stipple engraving works by bringing figures from light into darkness. Echoing the choice to disregard Southworth & Hawes from the credit line upon publication, Welch's engraving of *Washington* visually rejects its photographic origins. The uniqueness, originality, and positive presence of the Daguerreotype was ironically erased through the method of stipple engraving. Rejecting the Daguerreotype's material specificities, Welch chose stipple engraving to highlight the paintedness of Stuart's *Washington*.

The Daguerreotype therefore aided in the production of the print which circulated across the Atlantic to be woven in Lyon, France. The translation of an image from painting to photograph to print was one that relied upon a variety of choices structured by positive-negative relationships. While the merest tilt of George Washington's image could restructure the viewing of a Daguerreotype, originality was overturned by Welch's choice to use, but not acknowledge, the Daguerreotype image as a guide for eventual mechanical reproduction. The negative-positive matrix, structured through the tonality of light and shadow, originality and reproducibility, was a productive space in which images were translated across surfaces. A series of inversions and distortions took place through the deceptive translation of the George Washington's likeness. Each distinct iteration reveals a network of image makers negotiating legibility and materiality in their attempt to disseminate images for further media synthesis. As this short example illustrates, the Jacquard loom synthesized images by relying on the interaction of earlier media forms. Operating somewhere between the interstitial status of original and copy, positive and negative, mechanic and handmade, the Daguerreotype served as an intermediary object whose status as an original ironically led to easier replication and mass reproduction.

Transmitting Negative.

A second, if not more influential intermingling of the Jacquard loom and photography, emerged in Britain from a Polish inventor, Jan Herr Szczepanik, in the last decade of the nineteenth century. Szczepanik produced inventions that, "by utilizing photography for weaving purposes, accomplished what it has taken the designer [of Jacquard-woven images] months, or even years, to complete."[35] The process of designing the Jacquard image for coding took a great amount of time and labor. For example, in the case of a large tapestry, the designer would, "fill

[35] "The Photographic method of Preparing Textile Designs," *The American Architect and Building News,* 70, Oct 6, 1900, 6.

up millions of such little squares before it was possible to puncture the pasteboard cards."[36] Whereas Daguerreotypes were integrated into the Jacquard process as a substrate for producing and circulating printed images, the advent of new photomechanical technologies at the end of the nineteenth century drastically altered the photographic potential of Jacquard loom. Particularly, Szczepanik's inventions manipulated the positive-negative binary related to prolific forms of mass image production to alter the translation of images into fabric.

In each of his inventions tied to the Jacquard loom - the electric punch card machine, the use of the "largest camera in the world" to create raster gridded image, and, finally, the integration of a cameratic apparatus which eliminated the use of punch cards altogether - Szczepanik attempted to innovate the method of image-to-punch card translation. Described in tandem, these inventions illustrate the gradual shift from a desire concerned with translating images across surfaces, and, later in the 1890s, a desire to transmit entire images through threads themselves. Szczepanik was an inventor of transmission rather than of translation. Using the positive-negative binary logic at each stage of his inventive career, Szczepanik synthesized photographic practices and Jacquard weaving to *transmit* images across surfaces and into materials. As we will see, his inventions in fabric anticipate a larger desire and inevitable transition to transmit images through threaded cables.

Szczepanik began a series of inventions integrating photographic logic into the Jacquard loom in 1888. To decrease the time and skilled labor necessary to make a punched-card code, Szczepanik painted an image with varnish on a large metallic plate which passed under a comb of electromagnetically-charged teeth (Figure 1.4). When rolled under the teeth, the image signaled to the machine to "punch" or "not-punch" a coordinate point on a pasteboard card. Szczepanik therefore created an apparatus which processed images in binary form.[37] Whereas photographs indexed light, the electromagnetic punch-card machine indexed the varnish's ability to prevent electric conduction. The invention of an automatic punch-card machine was akin to the Jacquard loom's ability to read and respond to a binary program. With his first invention, Szczepanik carried on the displacement of human hands began by the Jacquard harness. The once-haptic punch card process had now become increasingly less human, and all the more mechanic, through the application of a distinctly photographic binary logic.

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[36] *Electricity: A Popular Electrical Journal,* Volume 14, June 8, 1898, 347.
[37] "The Production of Weaving Designs by Photography," *The Penrose Journal*, 1903-1904, 1-7

Szczepanik attempted to create "plate designs by photographic means instead of by hand painting" after the inventing the card-cutting machine that 'scanned' its images into a code.[38] To further obviate the hand, Szczepanik desired images to be 'readable' through a cameratic apparatus alone. Before doing so, however, the inventor had to expand images to proportional sizes for weaving. The same concerns of scale previously encountered in the translation of Stuart's image of *George Washington* into a Daguerreotype were still present in Szczepanik's weaving. In this case, the standard lens and camera needed to be expanded to correctly resize an image for replication. To solve this issue of scale, Szczepanik decided to invent a gigantic camera and railtrack (Figures 1.5).[39] Many reporters commented on the size of the camera noting that it, "weighs about two tons, and its full stretch when opened out on the wooden railroad that carries it is nearly twenty feet. The lens is five inches in diameter, and the plates are four feet square, each one weighing sixty five pounds."[40] The camera would photograph a plate with thousands of little square plates, or rasters, to be read by his punch card machines. The photographed images on the plate were not only the correct size for weaving, but "naked with thousands, or maybe be millions, of dots grouped in different orders so fitted together as to impart precise definition to the several portions of the woven figure or design."[41]

Szczepanik therefore desired a way to create the necessary grid on top of all designs with the help of a photographic process. One commenter stated in shock of the photographic stencil, "These plates are the most wonderful in some respects of their kind. They are divided into over 800,000 little squares…[that correspond] to the threads, shading, and bindings….with mathematical accuracy."[42] It is here where negative photographic practices became tools themselves for making scannable images. A newspaper article described Szczepanik's process as follows: "having chosen the pattern, say a landscape, the web is to show, he attaches a picture of it to an upright board. The next thing is to insert a suitable ruled screen immediately in front of the sensitive the silver bromide paper." Szczepanik would proceed to take negatives of every part of the pattern in succession, creating a layered key of negative images to be woven. Each layer represented not only part of the image, but a part of its dimensionality. For "the production of shaded work, selected plates are employed...these secure an accurate

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[38] Ibid.
[39] Ibid.
[40] *Pearson's Magazine*, Volume 8, 1899, 496.
[41] "The Production of Weaving Designs by Photography," *The Penrose Journal, 1-7.*
[42] "Textile Designs by Photographic Methods," *Wilson's Photographic Magazine (1889-1914)*, Nov 01, 515.

graduation of tones perfectly in harmony with the photography from which they are derived."[43] Szczepanik was creating an raster-gridded image that registered its own plausibility of being woven *within* its surface. The invention is perhaps an analog representation of the raster grid used in contemporary computer graphics, which, as W.J.T Mitchell points out, "has a limited spatial and tonal resolution...containing a fixed amount of information."[44] Szczepanik used the binary logic of photography to create a pixelated programs for the production of images in silk. As this example attests, the programmatic raster grid is a device grounded in the historical experimentation wagered between photography and weaving.

This layering of negative plates gave way to Szczepanik's ultimate mechanic intermingling of photography and the Jacquard loom. Featured in news photograph (Figure 1.6), we see Szczepanik combined loom and camera into one apparatus. The machine worked by means of a carbon process in a mode similar to zinc etching. Szczepanik would transfer the design onto a thin sheet of metal, alleviating the need to make the Jacquard stencil on a silver bromide paper as described above. Once the negative plate was prepared, a scanning device read the"light passing through the negative of the design," which, "[entered through] a pair of lenses, between which was fixed the small metal plate of the proper shape for developing marks on the sensitized paper."[45] Finally, Szczepanik took the signals from the charged plates, and, "with a similar contrivance attached, not to the punching machine, but to the Jacquard loom, he set in motion not only the punching levers, but also the threads in the loom itself; in short he weaves direct from the original design plate by means of electricity."[46] Although sources are slim for this incredible invention, the photograph alone suggests that Szczepanik desired to transport the image through photographically aided threads. By obviating the punch card through the literal combination of negatively preparing an image and attaching the 'scanning device' to the loom's thread, Szczepanik removed punch cards entirely.

Szczepanik's processes caused an avalanche of press responses. To some, the weaving industry would be "revolutionized" once Szczepanik's binary processes were able to weave photographic images automatically.[47] While it is unknown whether Szczepanik's invention ever made it to the Paris exhibition of 1900, newspapers and

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[43] "The Production of Weaving Designs by Photography," *The Penrose Journal*, 1-7

[44] William J. Mitchell, *The Reconfigured Eye: Visual Truth in the Post-Photographic Era* (Cambridge, MA: MIT Press, 1994), 6.

[45] "The Production of Weaving Designs by Photography," *The Penrose Journal, 1-7.*

[46] Ibid.

[47] "Weaving Industry Revolutionized," *Boston Daily Globe*, Dec 04, 1898, 25.

journals nevertheless wrote about the machine's uncanny effects. One commentator made the machine into a monster of sorts by stating, "It is as if the machine were endowed with thousands of eyes and thousands of fingers, every part of the design being faithfully rendered."[48] That the description of Szczepanik's machine becomes a monster-human reveals an anxiety between the mechanically-aided replication of images. The fantasy embodied in Szczepanik's images also captured the fascination of Mark Twain, whose portrait was woven by the Polish Edison (Figures 1.7 and 1.8). As these examples attest, Szczepanik's devices were attempts to escape the burden of translating reproductive images across space and through different materials. The inventor desired to capture and transform likenesses in mere minutes. The threadedness of the loom would eventually inspire Szczepanik's telectroscope. An image printed in *Pearson's Magazine* illustrates a man sitting in his living room watching a screen of an Egyptian scene far away, merely connected by a thread-like wire (Figure 1.9).[49] While perhaps more concerned with the transmission of images across vast distances, the hypothetical telectroscope illustrates the natural evolution from his experiments grounded in the manipulation of negativity in thread.

Negative Portraits

Friedrich Kittler writes in his *Optical Media* that, "the consequences of unlimited copying are clear: in a series first of originals, second of negatives, and third of negatives of a negative, photograph became a mass medium. For Hegel, the negation of a negation was supposed to be anything but a return to the first position, but mass media are based on precisely this oscillation."[50] Despite its ability to lead to mass production as well as foreclose Hegel's dialectical wish, the negative was the logic for the intermedial making of images in the nineteenth century. Whether through Daguerreotyping an engraving plate for limitless circulation or the attempt to combine loom with camera, negatives were treated as the hinge that transcended medium specificity. Approaching the Jacquard loom as an synthesizer of photography, visually and operationally, allows us to see how the *negative* was the logic behind efforts to combine forms of media meant for the translation and eventual transmission of reproductive images across material. Oddly enough, even without the connection to the Daguerreotype or Szczepanik's intermedial machines, the Jacquard woven image always inhabits the photographic binary. When

[48] "The Production of Weaving Designs by Photography," *The Penrose Journal, 1-7.*
[49] 'Seeing by Wire," *Pearson's Magazine*, 1899, Early Popular Visual Culture, 6: 3, 305 — 312
[50] Friedrich A. Kittler, *Optical Media: Berlin Lectures 1999, (*Cambridge, UK ; Malden, MA: Polity Press, 2010), 134.

turning over a Jacquard-woven image, such as the one in Figure 1.10, a negative is clearly shown. By binding two geometric grids of thread into an image with a positive and negative side, warp and weft weaving always produces a laterally and tonally reversed image on its opposite side. Jacquard images are thus much like the Daguerreotype: always *negative* technical images.

Figures:

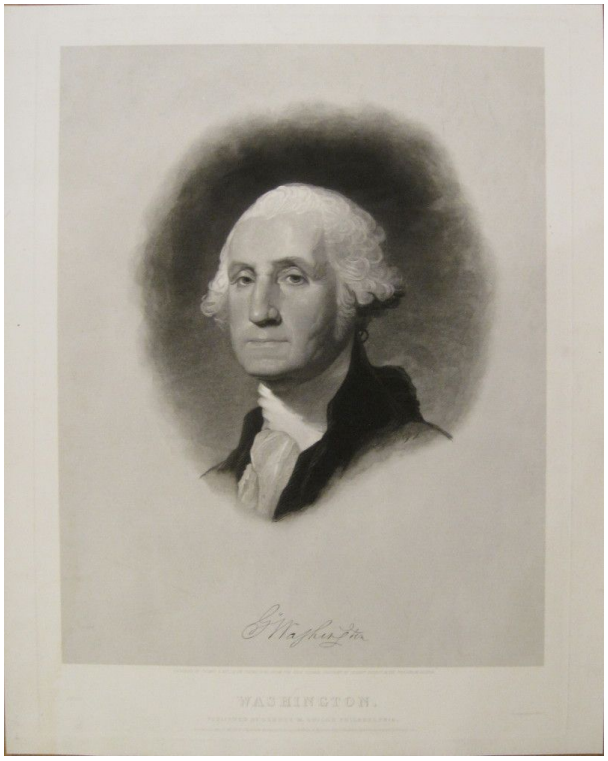


Figure 1.1. Engraving by Thomas B. Welch, Published by George W. Child. Printed by A.E. Lent in Philadelphia in 1852. George Washington after Gilbert Stuart. Stipple Engraving.

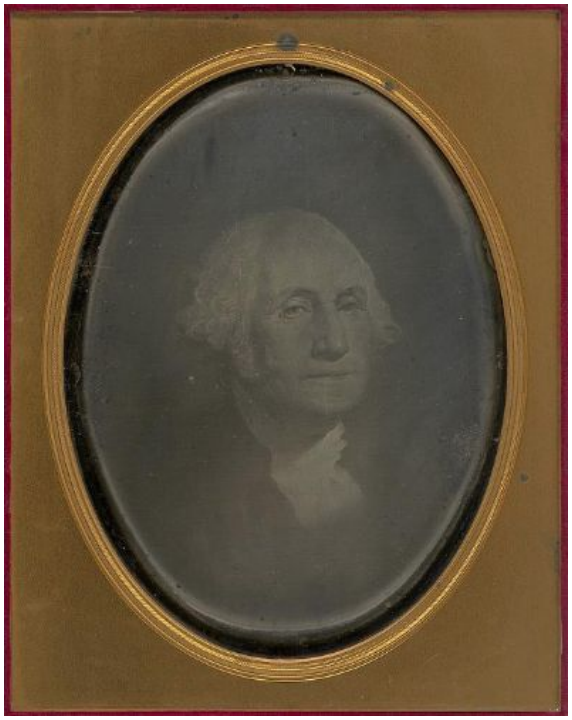
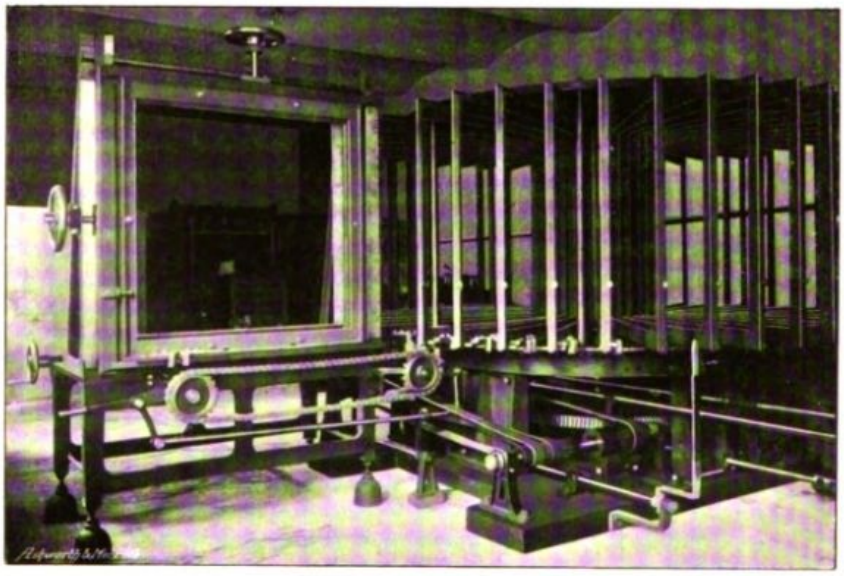


Figure 1.2 Southworth & Hawes, *Copy of Gilbert Stuart's George Washington.* Quarter-Plate Daguerreotype 1851.

Figure 1.3. Southworth and Hawes, "The Greek Slave," by Hiram Powers, Daguerreotype, 1848.

SZCZEPANIK'S ELECTRIC CARD-CUTTING MACHINE.

Figure 1.4. Szczepanik's Electric Card-Cutting Machine. *The Penrose Journal*, 1903-1904.



SZCZEPANIK'S REPRODUCTION CAMERA.

Figure 1.5. Szczepanik's Reproduction Camera. *The Penrose Journal*, 1903-1904.

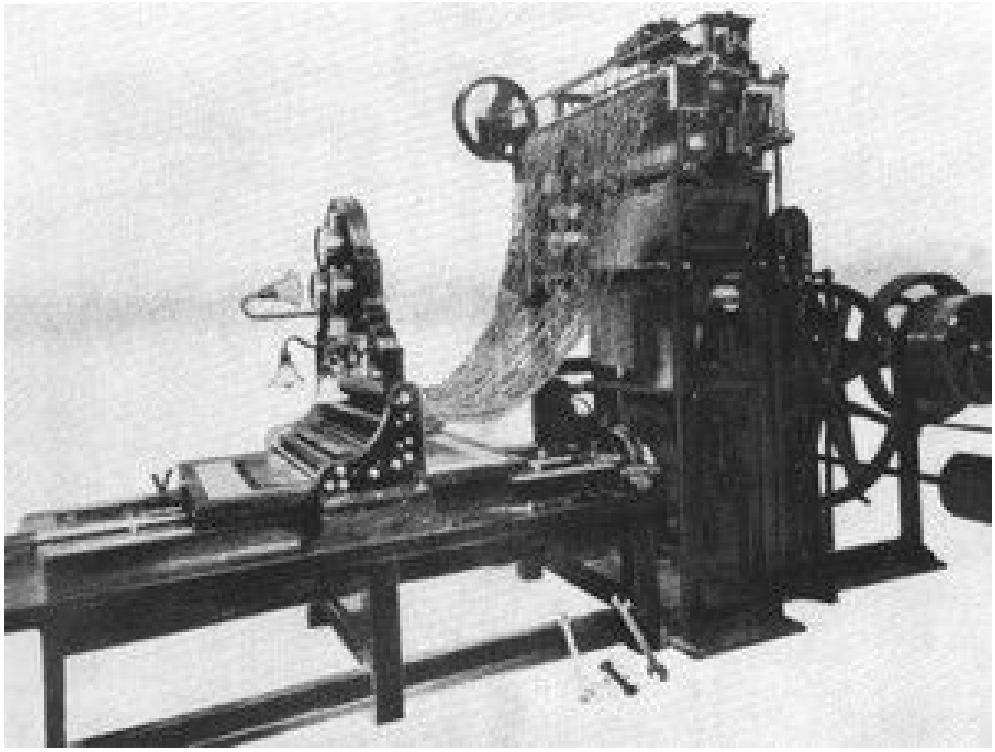
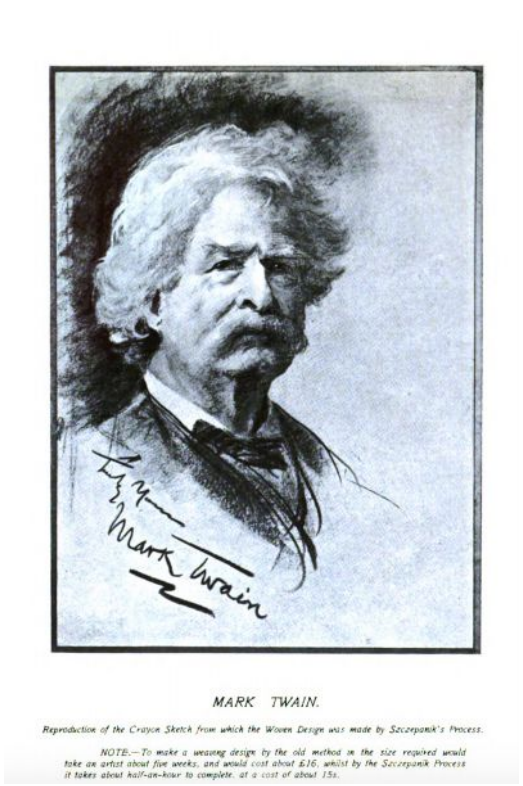
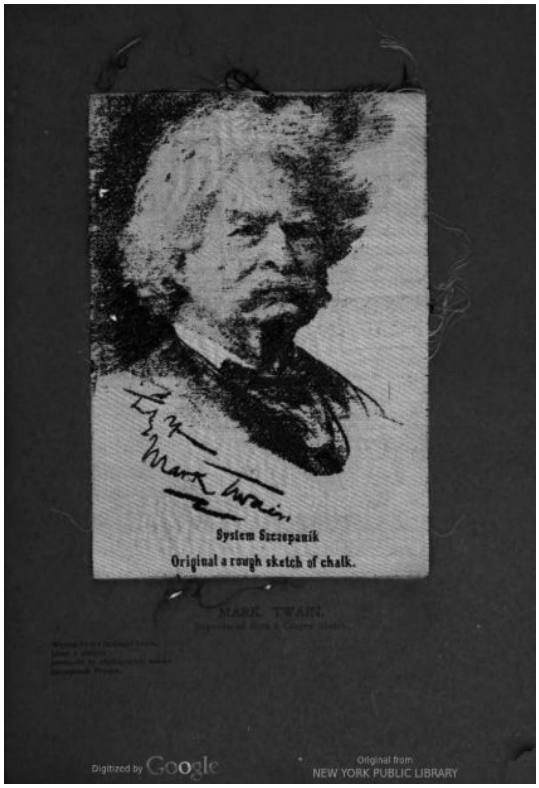


Figure 1.5. Szczepanik's Automatic Loom. ww.tarnow.pl/szczepanik/





Figures 1.7 and 1.8. Sketched and Woven Portraits of Mark Twain. *The Penrose Journal*, 1903-1904.

Figure 1.9. Illustration for Szczepanik's Telectroscope. *Pearson's Magazine*, 1899

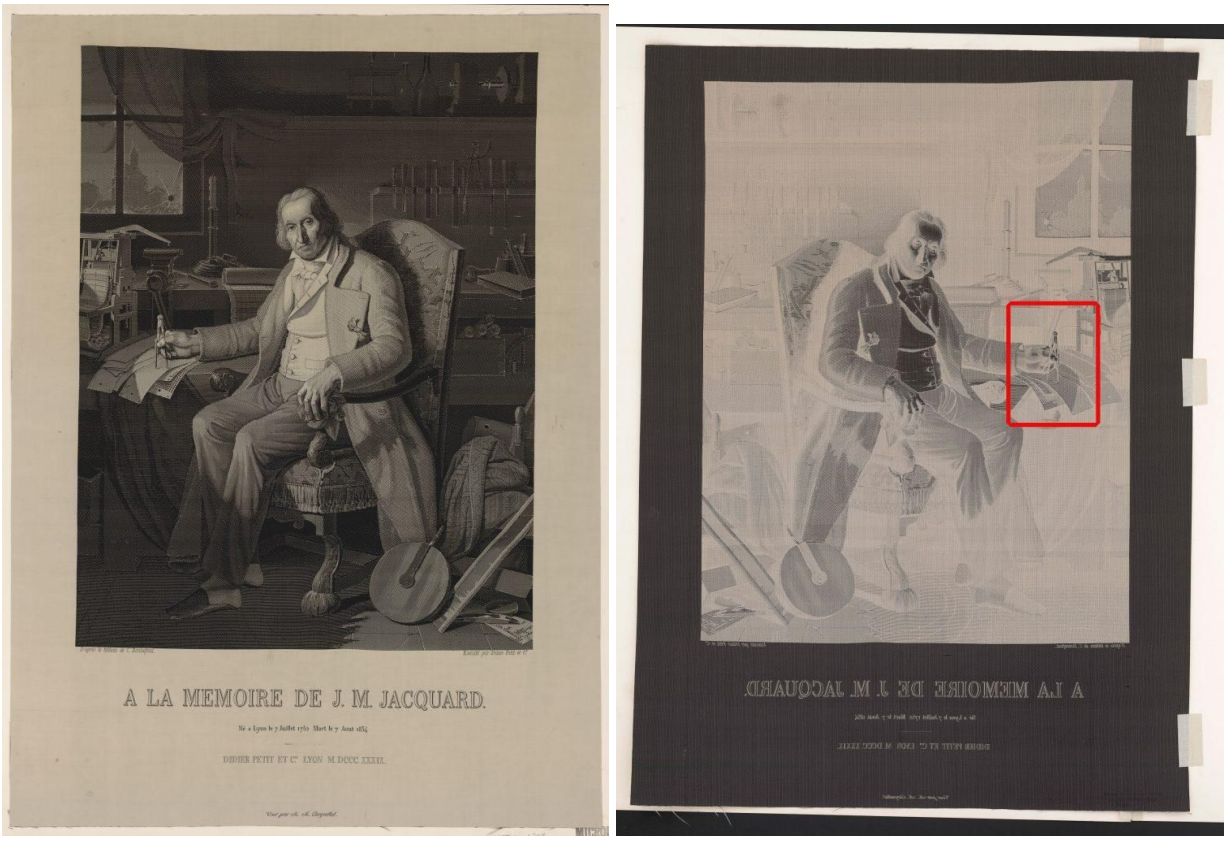


Figure 1.10. Front and Back View of *À la mémoire de J.M. Jacquard / d'après le tableau de C. Bonnefond ; exécuté par Didier Petit et Cie.* After a painting by Jean-Claude Bonnefond. Woven by François Michel-Marie Carquillat, [1839]. //hdl.loc.gov/loc.pnp/pga.05948

Chapter 2

In 1855, viewers of the woven *Washington* (Figure 2.1) contextualized the woven image via its indexical relationship to the print medium: "the likeness is perfectly preserved; it is at least quite evident that the artist had a power to preserve it as readily a*s if he were engraving it on copper.*" If other viewers thought the, "(silk) pictures resembled engravings in their delicacy and clearness," a relationship between prints and Jacquard-woven images existed within visual perception.[51] Comparing the woven portrait to its printed ancestor, viewers contextualized the new form of reproductive media within a pre-existing media logic, thereby perceiving the silken replica as a print materially and visually. *Washington* was therefore reliant upon pre-existing forms of mechanical reproduction to ensure its genesis in thread, such as the Daguerreotype (Figure 2.2) and stipple engraving (Figure 2.3), and

[51] Quoted found in "A Present to the City," *The New York Daily Tribune*, September 14th, 1855.

contextualized by viewers within an already operating system of print-based perception. That print was the medium viewers grappled with the eccentricity of *Washington's* portrait comes as no surprise, for the silk portrait literally emulates printed matter. Indeed, the flattened logic of geometric perception so popular in art of the nineteenth century remediated the newly-made silken image.

This visual equivalence has a deeper resonance when we comparatively assess the processes of printing with those of Jacquard weaving. Both reproductive methods strategically made the labor of image making invisible in the nineteenth century. Invisible labor is work that contributes to the making of an object but is often obscured in its finished form.[52] For example, tasks such as cleaning tools, setting type, punching holes, and wiping plates are necessary to print and weave images, but are seldom visually detectable. Although they required the application of precise forms of craft knowledge, these instances of *visual displacement* are perhaps mirrored in the tendency to reductively analyze each method of image-making's contribution to large-scale economic systems, rather than acknowledging the many intermediary steps taken to produce final images. It is certainly true that the printing press rapidly altered access to text and image; the Jacquard loom, too, increased production through its reliance on the systematic division of labor through nineteenth-century industrialization and automatization. These economic-based approaches to each reproductive method, however true, overlook forms of knowledge already foreclosed by the image itself. The final image and systemic analysis therefore share something in common: they continually make forms of craft labor invisible, hard to detect, and often unknown. Rather than continue this dual displacement, this chapter traces the variety of craft techniques necessary to translate the print of *George Washington* into a Jacquard-woven image.

While the relationship between printing and weaving is seldom discussed, art historians have previously interrogated the relationship encountered between copies of an image in different mediums. Stephen Bann, for example, has explored "the discursive space opened up by the parallel practices of printmaking, painting and photography, and their shared involvement in image reproduction."[53] By focusing on the craft techniques which

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[52] No labor is truly Invisible. I use the word displacement throughout the chapter, instead. See Jennifer Roberts, "On Mis-Expertise: Writing About Making." Minding Making, accessed March 24th, 2019, https://www.mindingmaking.org/project_misexpertise

[53] Stephen Bann, *Parallel Lines: Printmakers, Painters and Photographers in Nineteenth-Century France,* (New Haven: Yale University Press, 2001), 8-11.

enabled the translation of paper into fabric, skills unacknowledged in the nineteenth-century discourse surrounding Jacquard looms, I hope to pry apart the discursive space between the printed image and the Jacquard-woven image of Stuart's *George Washington*. As we learned in the first chapter, Welch's *Washington* was a collapsed painting and photograph, a copy of a copy. While the networked relations created through copying are worth highlighting, it is important to acknowledge that unlike the painting, Daguerreotype, and print, the Jacquard-woven copy of *Washington* relied on a completely different ontological form of illusion to appear before viewers. Whereas prints have an indexical relationship to their reproductive plates, the Jacquard-woven image shreds this relational form of perception entirely.

Dimensional fidelity was achieved on the top surface of the fabric image, but the symbolic code enabling the woven image's instantiation ultimately obscures the relational perception promised by prints. Viewers were able to perceive the image of *Washington* as a print without acknowledging a binary code that existed beyond its surface. With this in mind, I hope to compare and contrast print and woven image beyond their image relation, and, instead, focus on how the many agents involved in the translation processes - human workers, machines, and materials - interacted to materially and epistemically shift how images *could* exist from binary codes: a form of image which betrays the representational logic common in the eighteenth and nineteenth centuries. This chapter therefore not only traces the translation on an intaglio copper engraving to a punch-card code, but stresses how this translation process visually afforded the displacement of craft labor. What I suggest is key to understanding these divergent practices of reproduction, one engaged with pressing ink and the other in weaving silk, is their respective reliance upon the cultural technique of the *gridded matrix* in the preparation of the image for translation. Both processes relied upon the grid to visually structure and mechanically reproduce Washington's likeness, but their respective manipulations are key to understanding how the conflation between print and Jacquard-woven image ultimately fails to account for their ontological differences.

The grid, so says Bernhard Siegert, is the cultural technique of modernity. For Siegert, the grid has tripartite function: "First, it is an imaging technology that by means of a given algorithm enables us to project a three-dimensional world onto a two-dimensional plane. That is to say, it is a type of representation that posits an antecedent geometrical space in which objects are located and that submits the representation of objects to a theory of subjective vision. Second, the grid is a general diagrammatic procedure that uses specific addresses to store data

that can be implemented in the real as well as in the symbolic (grids may be two- or three-dimensional or 2D/3D hybrids). Third, the grid serves to constitute a world of objects imagined by a subject...The grid, in short, is a medium that operationalizes deixis."[54] Siegert's tripartite functionality is concerned with spatial subjectivization through modernity, but his idea has particular resonance when considering the grid as a tool for image production, and, more importantly, the grid as a material technique which enabled the post-modern, digital landscape in which we now deictically relate. As one of the oldest cultural techniques, the grid strategically links the techniques of weaving to digital images. As Hannah Higgins has claimed, the Jacquard's punched cards served as, "the mechanism of transition between the soft grids of textile technology and the hardware of the information age; it translated the net from its physical expression in textiles to a modeling form that would tabulate, sort, and integrate."[55]

Following these scholars, I want to stress the fabric grid's importance in altering our relationship to images. This chapter interrogates how the many agents of producing woven images - material, machine, and human worker - *inhabited* the form of the grid, and, in the process, enabled images to exist apart from their binary codes and the labor necessary to make them. The grid served a material and metamorphic technique which structured the visual displacement of craft labor within the translation from paper to woven interface. By understanding how grids structured the non-visualization of labor in the Jacquard-woven image, we can better understand how digital images visually obscure the labor necessary for their making.

Cracks in the Window

Long before George Washington's physiognomy was woven in silk, an exquisite portrait was woven by François Michel-Marie Carquillat somewhere between 1834 and 1839 (Figure 2.4). Joseph-Marie Jacquard's now famous portrait, originally painted by Jean-Claude Bonnefond, was one of the first of its quality wrought upon the Jacquard loom. Woven images existed as tapestries before the advent of the Jacquard harness, but the precise visual definition featured in Carquillat's portrait had everything to do with his ability to use the Jacquard loom. The portrait illustrates the loom's inventor in typical fashion. Sitting regally in an upholstered chair, an elderly Jacquard looks out to the viewer with a tilted glance. Jacquard effortlessly handles his calipers, used to measure the holes in each

[54] Bernhard Siegert and Geoffrey Winthrop-Young, "(Not) in Place: The grid, or, cultural techniques of ruling spaces," Chap. 6 in *Cultural Techniques : Grids, Filters, Doors, and Other Articulations of the Real* (New York: Fordham University Press, 2015).
[55] Hannah Higgins, *The Grid Book,* (Cambridge, Mass.: MIT Press, 2009).

punch card, as he sits next to a miniature model of his invention. Behind his full figure, a desk sits littered with instruments for measurement and an unfolding roll of carte-de-visite paper. Tools for lacing together punch cards sit next to an unravelling swath of fabric on the floor. The unfurling textile is echoed visually throughout the woven scene; Jacquard's regalia, the carpet on the floor, and the translucent window curtain all illustrate their threadedness with inscrutable detail. The many fabric objects surrounding Jacquard inscribe the woven portrait's materiality and his technical prowess. As a painter demonstrates their skill through illustrating various textures in paint, the image of Jacquard engages in an ongoing feedback loop between substrate and image. The image illustrates fabric *in* its fabric interface.

The actual processes necessary to make the many fabric objects illustrated, however, are not visually present. Each craft process - from gridding the design, to perforating and lacing the punch cards, to the weaving itself - is only referenced through the tools and many final products illustrated. The only visual trace of craft labor is found in Jacquard's delicate hand that limply holds his calphiers, and, even then, he gazes at the viewer rather than intensely focusing on the detailed hand-punching process. Likewise, as he ignores the task of his right hand, Jacquard ignores the accident visible in the gridded window behind his figure. The outline of Lyon, the city where Jacquard lived and where France's silk industry was concentrated, lies in shadow in the background. With layered transparency, the bottom right pane of the window-grid is visibly shattered. The small hole and radiating fissures in the glass indicate an outside intrusion in Jacquard's intricately detailed room.

Leaving a crack in the physical window as well as Jacquard's reputation, the hole gestures to the Luddite revolution started by Jacquard's invention. As James Essinger notes, "there is a story, still spoken of in the few remaining weaving workshops, that Jacquard was once accosted by angry draw-boys…[that] were furious with him for having invented a machine that had put them out of work."[56] Perhaps from a rock thrown in by displaced detractors, the small hole references the complicated socio-economic ties the weaving of this image entailed. This portrait makes clear that the invention of the Jacquard loom is embedded within a longer history between the displacement of human labor and new technologies. Carquillat's image of Jacquard ironically visualizes the

[56] James Essinger, *Jacquard's Web : How a Hand-Loom Led to the Birth of the Information Age (*Oxford ; New York: Oxford University Press, 2014).

mechanics of displacement caused by the machine it honors. By *not* illustrating the craft skills required nor the many hands involved in its own insanitation, the image iconographically registers its own ability to displace hands.

That the hole in the Jacquard's uneven popularity made it into the final woven image is intriguing. By seeing through the window, quite literally a grid mediating the experience of vision, viewers "see" the displacement of artists and craftsmen concerned with the Jacquard loom's impact on their craft economies. The Jacquard loom's ties to computation are therefore not only within the creation of binary software, then, but the discursive networks extant between craft labor and digital capitalism extended between the nineteenth and twenty-first centuries. Oddly enough, an economic transaction between this woven image and the hailed creator of computation further weaves together this entangled story. Charles Babbage, the British inventor perhaps most famous for his speculative analytical engine, bought the fabric *Jacquard* to display to his houseguests in 1836.[57] Babbage, known for intricate gimmicks, tricked many an enchanted guest into thinking the fabric portrait of *Jacquard* was a printed engraving.

As one of the many mathematicians interested in manipulating the binary punch card system as a storage and operating system for numerical data, Babbage used the woven image of Jacquard to inform guests how his never-built analytical engine relied upon the binary punch cards to function. Beyond his hijinks, Babbage could have explained how human hands were necessary for the image's production; instead, he operated like the Jacquard loom, displacing the complex craftsmanship necessary to make the image. Babbage's choice to use the woven image in his explanation of mechanical efficiency is mirrored by his earlier work on labor relations within factories. For example, in his *Economy of the Machinery and Manufactures*, published two years before he integrated his difference engine with textile production, Babbage noted that the introduction of machinery, "does not...invariably throw human labour out of employment," rather, machinery allowed, "women and young persons of both sexes, from fifteen to seventeen years of age find employment in power-loom factories."[58] Despite this reprieve, Babbage is historically characterized by his suspicion of human hand's ability. As Maxine Berg writes, "Babbage regarded the machine as a great corrective of the indiscipline of labor: it could function as a check against inattention, idleness, and dishonesty." Calculating labor as he calculated numbers, Babbage saw craft skill as inconsequential to the goals of industrialization. Much as the Jacquard loom visually displaces its physical binary code, Babbage, too, displaced

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[57] Ibid
[58] Maxine Berg, *The Machinery Question and the Making of Political Economy 1815-1848 (New York: Cambridge University Press, 1980.)*

his own reliance upon the skilled labor of others for his ideas. Ada Lovelace, a female mathematician, was essential to Babbage's thinking around the analytical machine but was only cited as a contributor to his calculating device. Lovelace aptly theorized the connection between Jacquard looms and calculation in her own writings. Indeed, it was Lovelace who related algorithmic logic's ability to "weave patterns as the Jacquard Loom weaves flowers and leaves."[59]

As we have seen, Babbage's many acts of displacement are made legible through his didactic use of the portrait, his *Economy of the Machinery and Manufactures*, and misogynist citational practices. Each of Babbage's actions metaphorically gesture to the Jacquard loom's perceived role in nineteenth-century industrial landscape: as a displacer of craft labor. Building from this connection, digital media historian Stephen Monteiro has compiled a striking analysis of the Jacquard loom's "fundamental consequences for digital computers and the [gendered] labor relations in the Industrial Revolution."[60] Much like Babbage's original thesis, however, Monteiro highlights the Jacquard harnesses' improvements as a way to historically excavate the ever-present relationship between the Jacquard loom and computational culture. Yet, this analysis ultimately obscures the craft labor involved in making the binary code during the nineteenth century. While the punch-card code increased production, it simultaneously required an influx in craft skill.

Montero's thesis is supported by Jonathan Crary's oft-cited dictum that in the nineteenth century, the "loss of touch as a conceptual component of vision meant the unloosening of the eye from the network of referentiality incarnated in tactility and its subjective relation to perceived space."[61] Building from Crary's claim, the Dead Media Archive has argued that, "the Jacquard loom was a site of simultaneous separation of tasks in both technological and sensorial aspects. On one hand, the weaver moved from the immediate interaction of creating the tapestry only to relegate the tasks to the machine itself. On the other, the loom presented a site-specific body of a medium in history that housed the separation of the senses, where touch divorced vision as a holistic informant of the eighteenth

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[59] Quote found in James Essinger, *Ada's Algorithm : How Lord Byron's Daughter Ada Lovelace Launched the Digital Age*, (Brooklyn: Melville House, 2014.)
[60] Stephen Monteiro, *The Fabric of Interface : Mobile Media, Design, and Gender* (Cambridge, Massachusetts: The MIT Press, 2017)
[61] Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, Massachusetts: MIT Press, 1992,) 60.

century 'unified human sensorium."[62] These analysis, important to understanding the still-present connection between the displacement of unskilled and feminized craft labor in our digital late capitalism, ignore the historic forms of skilled labor that remained important before and after the implementation of the Jacquard loom. Like Babbage, these theorists primarily highlight the use of binary punch card's diminishment of the drawloom's two-person operating system. The operationality of the Jacquard loom certainly displaced tactile labor, but the punch-card *code,* as an object, did not. Due to its simultaneous existence as illegible image, efficient tool, immaterial code, and material substrate, the making of the punch-card code itself has naturally been overlooked; only the punch card's relationship to computational capitalism has been indexed.[63] Rather than focus on the tooling of the Jacquard loom itself in the displacement of labor, I want to bring attention to the craft labor and displaced laborers necessary for the translation of image into code-image.

Punching Holes

Somewhere between 1851 and 1855, Thomas B. Welch's Daguerreotyped stipple engraving of Stuart's *Washington* was carried across the Atlantic by a Philadelphian ambassador to Lyons, France. At the consul's request, Messrs. *Ponson, Philippe, & Vilbert* translated the printed image into silk over a two year period. At the weaving workshop, the image was scaled, forced through a gridded chart, slowly translated into a series of over 20,0000 binary punch cards, and finally woven into a legible interface made of black and white threaded matrixes. The translation of any Jacquard-woven image requires several coordinated maneuvers of the hand and eye, especially those with the visual acuity and complexity of the *Jacquard* or *Washington*. The generation of such a visually striking image, then, necessarily entailed complex forms of visualization, draughtsmanship, measurement, physical force, and precision far before it was woven. Coding required *craft technique*. The remainder of this chapter

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[62] "Jacquard Loom," *Dead Media Archive*, Spring, 2010, accessed March 24th, 2019. http://cultureandcommunication.org/deadmedia/index.php/Jacquard_Loom

[63] George Caffentzis writes, "An important reason for the neglect of Babbage's Engines was that neither Babbage, nor Marx, nor anyone else at the time saw the essential connection between computation and all forms of the labor process, even though the key...was the Jacquard Loom." in his, *In Letters of Blood and Fire : Work, Machines, and the Crisis of Capitalism*. (Oakland, California: Autonomedia, 2013).

addresses the forms of craft labor entailed in the making of the code-image of *George Washington*, arguing that these multi-material and multi-modal processes are key to understanding how the conflation of printed images and Jacquard images displaces craft labor. The binary code, made from pasteboard and punched holes, required skills that have historically been dismissed. Just as the viewers of a Jacquard-woven image cannot not visualize the code behind the image's surface, scholars have largely not seen the labor displaced by focusing on the machine and not the making of the tool. By treating the code itself as an object for analysis, I uncover the ways in which craft labor was displaced through the image of *Washington*.

The process of making the image-code, as we have seen, is seldom discussed in literature surrounding Jacquard loom. Although the labor was certainly acknowledged as taking place, for instance, one journalist described, "[the Washington] has passed through the hands of several artizans, nearly two years were required in its manufacture," this labor was likely referring to making the woven image and not making the code.[64] This disregard is due in part from misunderstandings common in mechanical instruction manuals for Jacquard weaving. For instance, T.F. Bell's *Jacquard Weaving and Designing* notes a categorical distinction between handlooms of the eighteenth century and the Jacquard looms in nineteenth. Bell states that there was a completely different way of making images between the two, arguing that handloom weaving entailed, "dividing [the image] into regions, each of which is assigned a solid color based on a standard palette."[65] Jacquard weaving differs, so says a contemporary Jacquard weaver, in that the, "repeating series of multicolored warp and weft threads can be used to create colors that are optically blended."[66] While Bell and contemporary weavers offer a wealth of knowledge about the Jacquard weaving process, this stark historical binary ultimately displaces the process of the 'paint-by-numbers' design still present in Jacquard weaving. If anything, the 'paint-by-numbers' process was a more complicated, lengthy, and skilled process with the Jacquard loom.

The 'paint-by-numbers' process was enacted through a grid. An image, in this case Welch's *Washington* print, was fit onto a sheet of mise-en-carte paper (Figure 2.5). Mise-en-carte, roughly translated as point-paper design, is a semi-transparent graph paper whose perpendicular lines demarcate spaces which dictate the intersections

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[64] *New-York Daily Tribune,* Sept. 14, 1855. 7.
[65] T.F. Bell, *Jacquard Weaving and Designing* (United Kingdom: Longmans, Green, and Co., 1895.)
[66] Ylva Fernaeus, Martin Jonsson, and Jakob Tholander. "Revisiting the Jacquard loom: threads of history and current patterns in HCI." In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (New York, NY, USA, 2012.)

of warp and weft threads. Once an image was copied onto this paper, the designer 'read' the small boxes indicating whether to punch the card. The spaces between the horizontal and vertical rows of lines correspond to a precise coordinate of warp and weft thread. According to Audry Millet, designers in charge of carrying out this process were often ignored in French society throughout the eighteenth and nineteenth centuries.[67] Certain figures, such as Pierre Bertholon, a member of the Montpellier academy of sciences, attributed the success Lyon's silk industry to these draughtsmen. In a speech celebrating Lyon's successful weaving industry Bertholon announced: "Never forget, O Lyon, that you owe to your draughtsmen much of the prosperity of your factories and that you are indebted to them for those miracles of industry that happen every day in your city."[68] Nevertheless, his comments never solidified into the official French sphere of artistry. There was no official name for this type of work until later in the twentieth century. That Bertholon's comment came before the invention and widespread implementation of the Jacquard loom is telling, for it identifies the inability to account for and accurately acknowledge the skills necessary in creating mise-en-carte images. The process of displacing labor was therefore solidified in the cultural landscape of artistic production.

Despite not being honored as artisanal skill in official discourse, the process of transferring the image of *Washington* onto mise-en-carte paper required a great deal of technical, artistic, and material knowledge. Szeszpanik's photographic process for image transfer had not been created, so Welch's *Washington* was likely hand-painted on the incredibly delicate graph paper by a designer over an extended period of time. In literally turning the image into a grid, the designer also simultaneously enlarged the image. Translation entailed a shift in the scale of the *Washington* print for readability by the punch-card maker. Designers had to be aware of how the paper design would produce an image in thread. It was not easy to avoid, for instance, "the bad effect of a silk whose design is too spread out ... because the designer painted on his ruled paper too large a mass of color without understanding the effect of its reduction [on the fabric]."[69] The mise-en-carte's scale corresponded to the image being copied and its eventual three-dimensional presence in silk. While mapping an image through a grid, the

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[67] Audrey Millet, "Factory Draughtsmen in Eighteenth- and Nineteenth-Century France," *Biens symboliques / Symbolic Goods*, 2017. Accessed on March 24th, 2019. https://revue.biens-symboliques.net/106

[68] Pierre Bertholon, *Du commerce et des manufactures distinctives de la ville de Lyon*. (Montpellier, Jean Martel Aîné, 1787) quote found in Audrey Millet, "Factory Draughtsmen in Eighteenth- and Nineteenth-Century France."

[69] Herman Blum, *The Loom Has a Brain: The Story of the Jacquard Weaver's Art*, (Philadelphia, PA: Craftex Mills, Inc., 1958.)

designer had to envision the image's instantiation through the intersection of multiple threads upon the highly complex, and prone to mechanical error, Jacquard loom.

Once the further-flattened form of the image of *Washington* was painted upon a mise-en-carte grid, a punch card translation occurred. The makers of the 20,000 punch card sequence of *Washington* likely used a lissage machine to automate the process of punching. While it is certainly possible that the 'data punchers' were using tools, like those in figure 2.6, to mark holes determining the intersections of warp and weft, lissage machines accelerated production and were popular in large-scale weaving house by the middle of the nineteenth century (figure 2.7). Making punch cards with the assistance of a lissage machine nevertheless relied upon the haptic conditioning of the laboring body. The holes in each card were "made by pressing a 'chord' of keys corresponding to the possible holes in that row of the card, and simultaneously stepping on a pedal to punch the holes and feed the card one row forward."[70] Much like the keyboard operators of the late nineteenth century, these 'point-paper readers' relied upon the coordination of their entire sensorial perception to translate the image of *Washington* into a binary punch-card code.[71] Describing the confusing process still persistent in the twentieth century, Howard Blum writes that the code-puncher, "Works his way through the bewildering network of lines, path of color -- a perfect maze of passages and tracks, punching holes in the oblong cards."[72] Likewise, Blum stressed that the "The card-cutter's task requires intensive concentration - keen eyes, nerves of steel, powerful fingers, strong arm and leg muscles. Working at high tension on an intricate design frequently brings the operator to a point of mental and physical collapse before the design is finished."[73] Gesturing towards physical as well as mental exhaustion, the punching of cards was no small task.

Once all 20,000+ cards were punched after a multi-month haptic experience of reading, translating, and cutting the image through various gridded structures, the code of *Washington* was sewn together in a long chain. The actual threading of the loom also required various techniques algebraic thinking. Complex diagrams (Figure 2.7) can be found in many weaving treatises illustrating how to correctly thread the loom once the punch-card code was completed. As an incredibly complex process that entailed an intimate knowledge of the loom itself, there was

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[70] Ylva Fernaeus, Martin Jonsson, and Jakob Tholander. "Revisiting the Jacquard loom," 2012.
[71] Ibid.
[72] Ibid.
[73] Howard Blum, *The Loom Has a Brain: The Story of the Jacquard Weaver's Art*, 1958.

surely added time of trial and error. Howard Blum describes, "[the weaver] must know the influence of the texture upon the weave and fabric, the arrangement of the threads in the dents of the reed, the different systems of tying up the Jacquard harness, and the stamping to the Jacquard card for the various kinds of textile fabrics."[74] Each step in this process entailed a variety of specific maneuvers of the hand, body, eye, and image. Intimate knowledge of manipulating grids was required of the designers, punch card cutters, and loom operators. These laborers and their skills, as we have seen our visual-material analysis of the woven Jacquard code, are displaced through the very silken images they sought to create.

Gridded Images

A decade after the inception of the woven image of *Jacquard*, Carquillat wove another image visually referencing his earlier portrait. The *Visite de mgr. Le duc D'aumale a la Croix-Rousse, dans l'atelier de M. Carquillat,* Figure 2.8, illustrates a scene of a royal minister visiting the weaving workshop of Carquillat. Shocking the group of officials, who likely thought the image was a print before they registered the fabric image's threadedness, Carquillat meta-narratively iconicizes his own making practice. The earlier *Jacquard* image visually represented within this woven image concretizes his skill in weaving silk images masquerading as prints. Behind, a drawboy looks sternly across his shoulder while operating under tendrils of punch cards loosely hanging from the towering Jacquard loom. Finally, an actual punch-card code is represented within a woven image. Carliquat successfully wove together the labor, the code, and the material for visual consumption. Even if this woven image portrays parts of its process, however, viewers could only engage with what was visually presented to them; viewers had no access the vertical code that was displaced by *Carquillat's* dramatic presentation.

In the end, the visual hijinks present in Carliquat and Babbage's bit to show a woven image as a print fails to illustrate how each image completes the guise of western illusionism differently. Take Welch's use of Western perspective upon his print matrix as case in point. Intaglio prints use a printer's matrix, often a copper plate , to press the visual plane of a final print onto paper. The visual space of the printer's matrix accurately illustrates the three-dimensional space it seeks represent because of an invisible, algorithmic use of the grid to map geometric perspective. Stuart's painting, and later Welch's Daguerreotype-turned-engraving, accurately represents the

[74] Ibid

three-dimensional presence of George Washington. It is unknown whether Gilbert Stuart used a drafting grid to accurately capture the proportions of Washington; nevertheless, the tool has been used for making three-dimensional objects appear in two-dimensional mediums since the Renaissance. An oft-cited image of Durer's drafting device illustrates how a three-dimensional woman could be foreshortened through a grid and illustrated proportionally upon a flattened piece of paper (Figure 2.9). To reiterate Siegert's thesis concerning grids, "First, it is an imaging technology that by means of a given algorithm enables us to project a three-dimensional world onto a two-dimensional plane. That is to say, it is a type of representation that posits an antecedent geometrical space in which objects are located and that submits the representation of objects to a theory of subjective vision."[75] This 'subjective vision' is foregrounded in any Jacquard-woven image. Instead of relying on the grid to structure space, however, the Jacquard-woven image uses uses two threaded grid to as its substrate. Using the grid lines and not the space in between them, woven images reverse the 'subjective vision' of western perspective.

Unlike the drawing grids of Durer, the grid lines making up the *Washington* image produce an image "made not of concrete components for an image-as-whole, but a latticed, sinuous weave that rejects the eighteenth-century perception of vision."[76] Thomas Welch's *Washington* was further-flattened with mise-en-carte paper, punched into a code of coordinates, and then made into a legible image through the intersection of two grids. Turning a two-dimensional image into a three-dimensional image, Jacquard-woven images obstructs William Ivin's dictum that perspective is a "means for securing a rigorous two-way, or reciprocal, metrical relationship between the shapes of objects as definitely located in space."[77] N. Katherine Hayles has described the historically grounded relationship between printed images and digital images as thus: "To distinguish between the image the user sees and the bit strings as they exist in the computer, Espen Aarseth has proposed the terminology scripton (the surface image) and texton (the underlying code). Stipple engraving, although it is normally perceived by the reader as a continuous image, operates through the binary digital distinction of ink dot/no ink dot; here the scripton is the image and the ink dots are the textons.... The flat page of print remains visually and kinesthetically accessible to the user,

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[75] Bernhard Siegert and Geoffrey Winthrop-Young, "(Not) in Place: The grid, or, cultural techniques of ruling spaces," Chap. 6 in *Cultural Techniques : Grids, Filters, Doors, and Other Articulations of the Real* (New York: Fordham University Press, 2015)

[76] "Jacquard Loom," *Dead Media Archive*, Spring, 2010.

[77] William Ivins, *On the Rationalization of Sight, with an Examination of Three Renaissance Texts on Perspective, (*Da Capo Press, 1973.)

whereas the textons of electronic texts can be brought into view only by using special techniques and software."[78] Extending Hales' apt description to the relationship between surface (scription) and punch-card code (texton), I suggest the difference between printed images and Jacquard images rests in their layering effects garnered through their respective manipulations of the grid. Whereas the print works horizontally within the accepted perspectival use of the grid and flat play of stipple engraving, the Jacquard-woven image operates in a vertical hierarchy: its scriptons and textons are visually and physically separated.

And here is how the Jacquard loom literally displaces the craft labor necessary to instantiate woven images. The Jacquard loom produces displacement by creating a punch-card image-code that is unattached to the legible image. The grid itself, a physical way of measuring an image, flattening the image, and, in the case of the final product, therefore tells another material and technical history of the Jacquard loom's engagement with craft labor. The crafted manipulation of grids during the code-making process instantiates an image that automatically displaces the labor of its making. Viewers experienced a new, vertically oriented form of illusionism: one, that, is just now manifesting its epistemic regime. The various gridded translations required in the analog code-crafting process, each necessitating a specific technical skill, provide a historic precedent for the ways in which digital images today displace labor. Much like the Jacquard-woven *Washington*, digital images hide what operates beneath their surface.

Although perhaps anachronistic to the nineteenth century, the ability for digital images to displace labor through binary code began in the transition from print-based reproduction to code-based reproduction. The logic of digital images operates entirely on the oscillation of visibility and displacement: simultaneously illustrating an image to the eye but displacing the materials, labor, and infrastructure necessary for its instantiation on a screen. Digital images procure a new form of illusionism far beyond the grid play of nineteenth-century art; indeed, one has to dig through the many layers of code, hardware, and e-waste to 'know' a digital image. Much as we have historically ignored the craft techniques necessary to enable prints to be metamorphosed into codes and then into woven images, digital image viewers seldom register the layers of craft labor which enable digital images to appear on our screens. The maneuvers implicated in the translation of *Washington* through various grids provides a methodological framework for understanding how the relationship between Art and media secured the global

[78] N. Katherine Hayles, "Print Is Flat, Code Is Deep: The Importance of Media-Specific Analysis." *Poetics Today,* 25, no. 1 (2004): 67-90.

mechanisms of the digital world. Perforation thus created the *software* that had drastic implications of how modernism's images were produced, transmitted, and experienced. The material bind between the image and substrate was fractured: images were finally free to float from their original traces.

Figures:

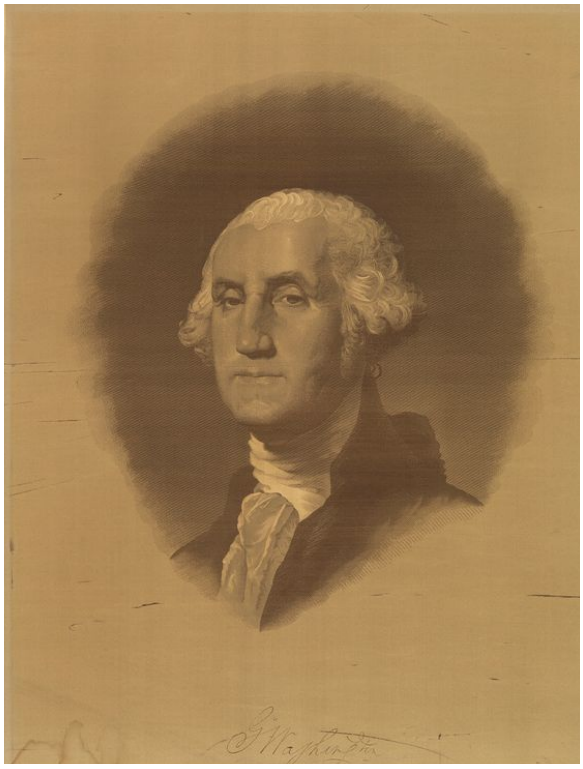


Figure 2.1. Messrs. Ponson, Philippe, & Vilbert. Jacquard-Woven Portrait of George Washington, 1855.

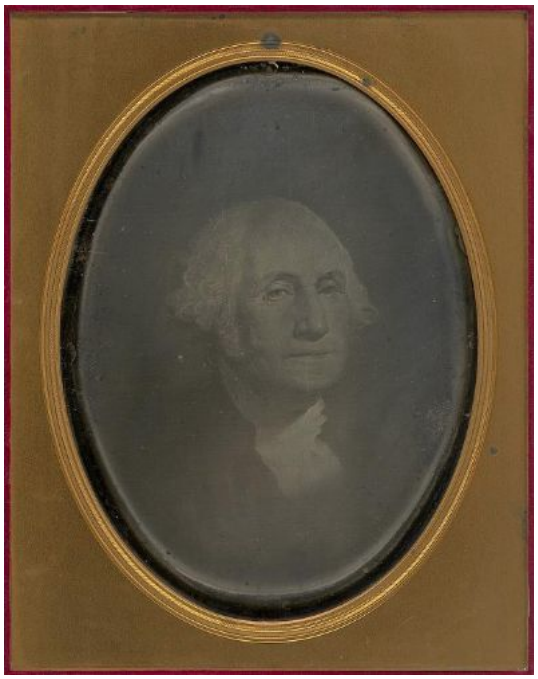


Figure 2.2 Southworth & Hawes, *Copy of Gilbert Stuart's George Washington.* Quarter-Plate Daguerreotype 1851.

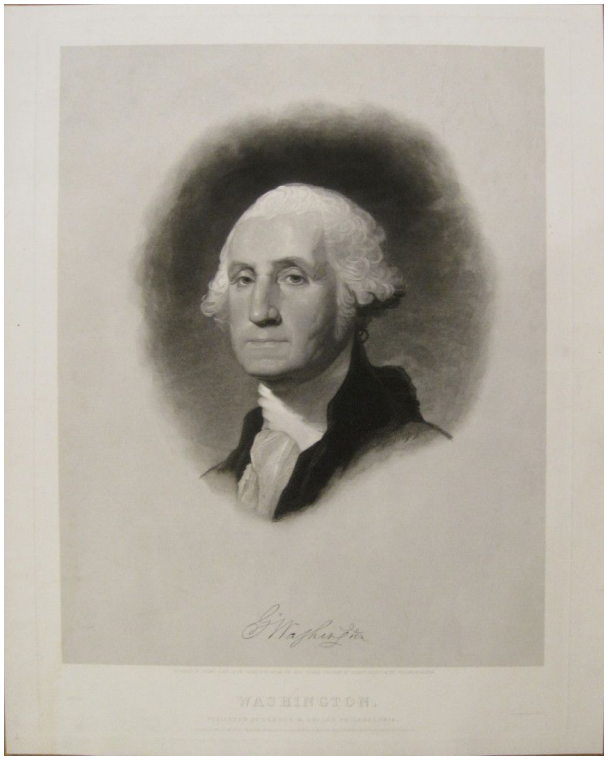


Figure 2.3. Engraving by Thomas B. Welch, Published by George W. Child. Printed by A.E. Lent in Philadelphia in 1852. George Washington after Gilbert Stuart. Stipple Engraving.

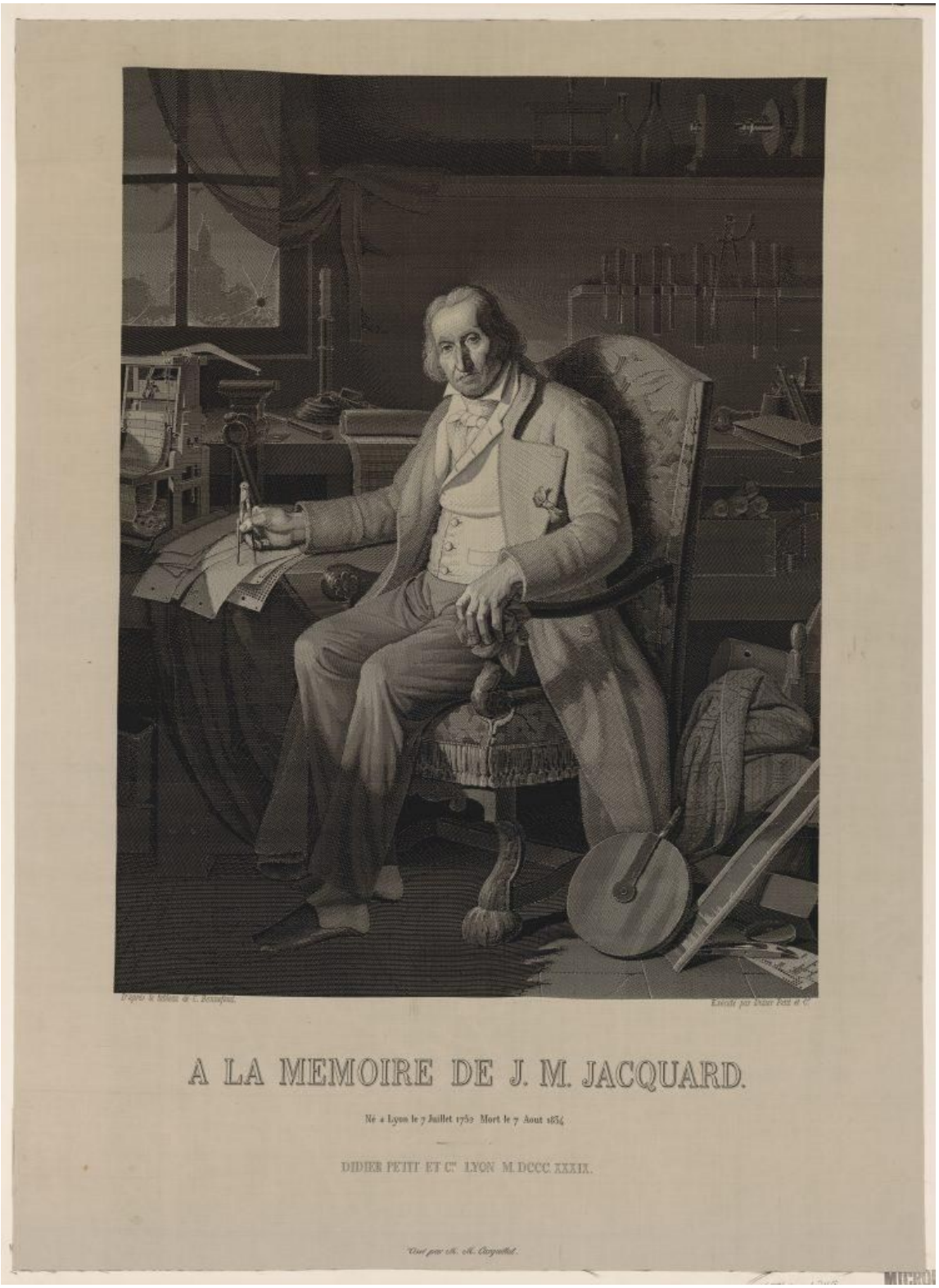
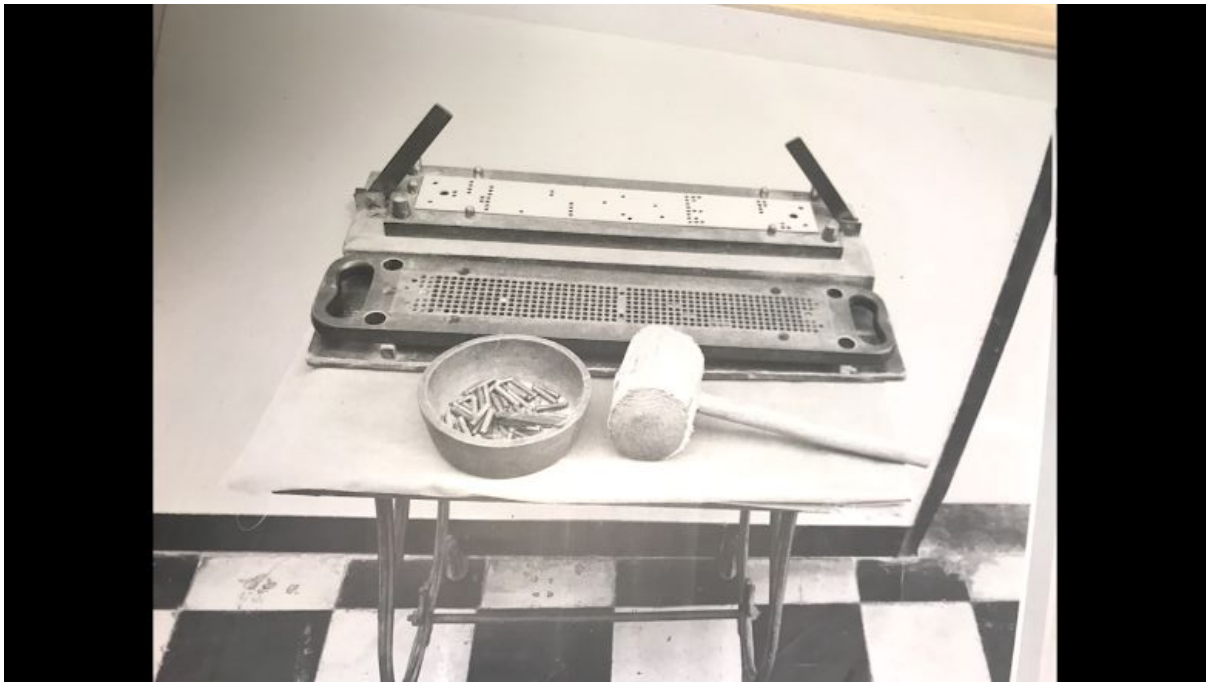


Figure 2.4. Front View of *À la mémoire de J.M. Jacquard / d'après le tableau de C. Bonnefond ; exécuté par Didier Petit et Cie.* After a painting by Jean-Claude Bonnefond. Woven by François Michel-Marie Carquillat, 1839.

2.5 Example of Mise-en-Carte Paper. Design drawn by Joseph Veret, French, active Lyon, Gouache on Paper, 1760 to 1770. Philadelphia Museum of Art.



2.6 Punch-card tools. Photograph from The Rita J. Adrosko Papers: 1965-1993.

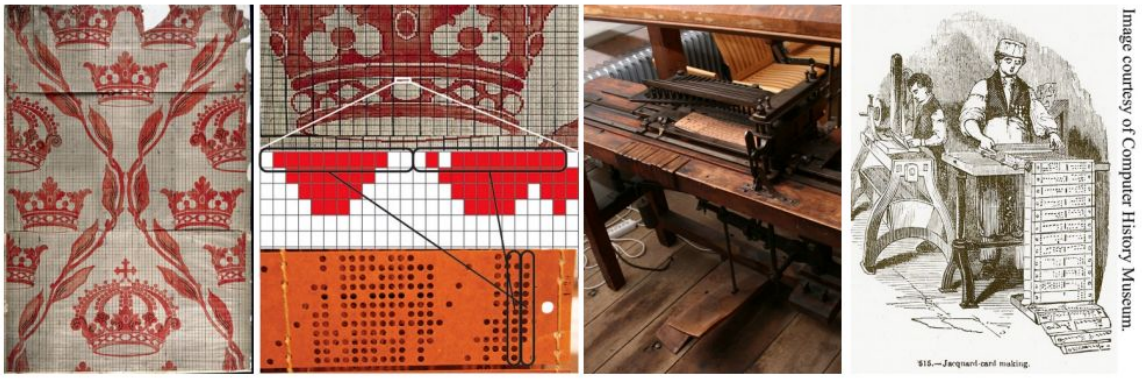


Figure 4. From left to right: a) the original pattern on point paper, b) relationship between the dots on the point drawing and the holes in the punched cards, c) the lisage machine at the studied weaving mill, with keyboard and foot pedal used for making holes in punched cards, d) the practice of punching cards using the lisage machine in the early 19th century.

Figure 2.7 Transfer Process from Mise-en-carte to Lissage Machine. Found in Ylva Fernaeus, Martin Jonsson, and Jakob Tholander. “Revisiting the Jacquard loom,” 2012.

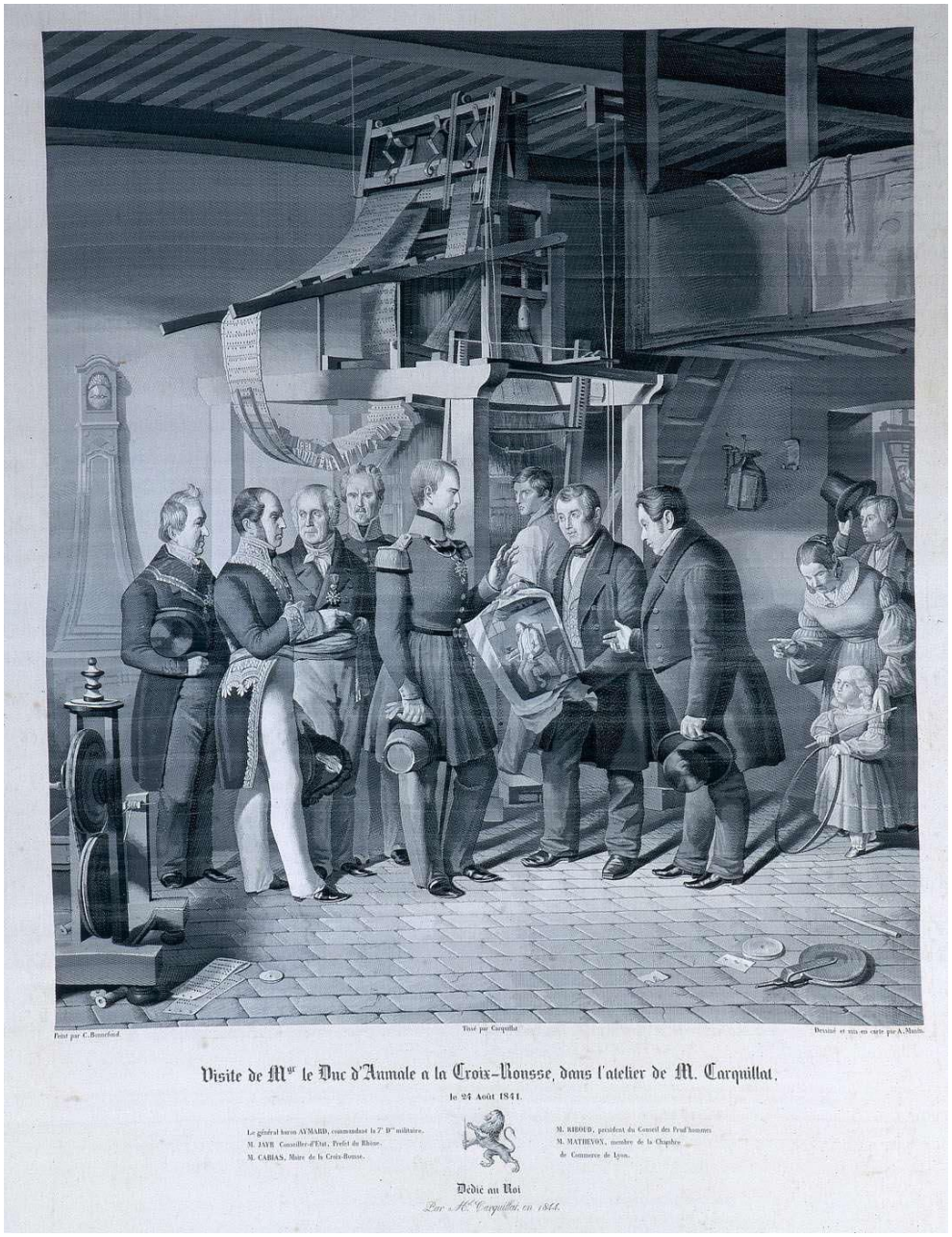


Figure 2.8 François Michel-Marie Carquillat. 'Visite de Mgr le Duc D'Aumale à la Croix-Rousse, dans l'atelier de M. Carquillat." Jacquard-woven silk. *Executed 24th August 1844, Didter Petit et cie, Lyon.* Image from Bonhams Auction House.

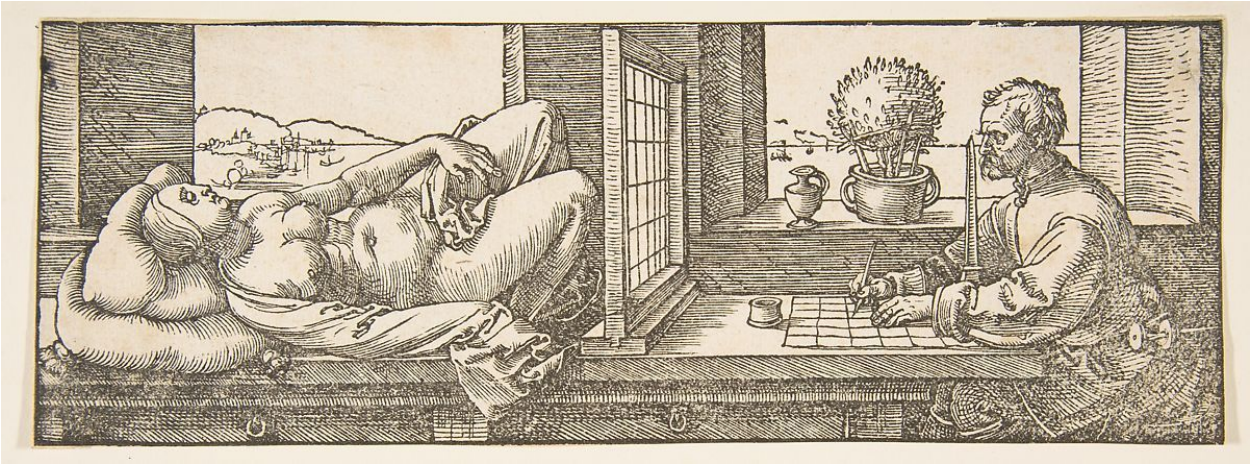


Figure 2.8. Albrecht Dürer*, Draughtsman Making a Perspective Drawing of a Reclining Woman*, ca. Woodcut, 1600. Metropolitan Museum of Art.

Chapter 3

The silken images of *Washington* (Figure 3.1) made their way across the Atlantic ocean in the arms American consul, C.S. Goodrich, sometime in 1855.[79] One copy was kept by Goodrich, who originally administered the production of the picture, while the other three 'multiples' were given to the cities of Philadelphia, New York, and Boston on behalf of the French.[80] Writing a letter in advance of his speech at the New York dedication of the *Washington,* Goodrich referred to himself as the *'transmitter*' of the woven *Washington*. Converting his body into a telegraphic consul, Goodrich had the 'honor herewith' to delicately carry the silken likeness of America's first president across the Atlantic ocean. Of course, Goodrich was not a telegraph. He did not behave like the form of representation which drastically altered communication across geographic distance. Goodrich and his multiple *George Washingtons* likely faced unknown conditions of interference during the 'transmission' journey: spontaneous elemental forces, consistent delays during travel, and, of course, the threatening possibility of Goodrich's death on the open waters. The code of the silken *Washington*, however, was left in Lyon; only the *visually* legible image, the silk *Washington,* was carried across the oceanic surface for display. Due to the divergent physicalities of the the image and code, the two could easily be separated geographically and temporally. Moreover, there was no program a viewer could use to mine for information about the image's coded origins and pathway across space and time. The silk image was not digitally connected to its code like *Untitled.Jpg*. As such, the Jacquard-woven image of *Washington* entered the transatlantic trade as a legibly flattened image, completely disregarding the code which enabled its fruition.

At every moment in *Washington's* translation across surfaces, I have paid attention to how the interactions between different reproductive mediums overcame their seeming material specificity. Gilbert Stuart's painting-turned-Daguerreotype rejected its peculiar uniqueness by transforming into an engraving plate's substrate. After the printing process, the stipple engraving was transformed into a binary code through a further flattening across paper grid and punch cards. Finally, a copy of the engraving was made legible *inside* silk. The silkened image was burdened like any other in the nineteenth-century world; despite its radical tooling through the displacement of

[79] The date is based on a transcribed note from Goodrich in the *Journal of the Common Council, of the City of Philadelphia,* September 13th, 1855. 518.
[80] "A Present to the City," *New-York Daily Tribune,* September 14th, 1855.

codes, it was an image operating under pre-existing patterns of transmission and reception. This chapter analyzes the *Washington's* journey from the woven factory, across the ocean, and into specific institutions of viewing within the Northeast United States. Contextualized and beholden to pre-existing associations surrounding the status of representation in the nineteenth century, the silken *George Washington* was contextualized within a pre-existing visual hierarchy. As we will see, the image's theoretical aims rose far above mass reproduction and easy transportation; rather, the image sought to be a testament of the French nation's undenying support of territorial and economic expansion of a quickly globalizing United States. Relying upon both silkenness and singularity for its exhibition as an art object, the *Washington* paradoxically rejected its possibility for mass reproduction.

Telegraphic Potential

The telegraph, a reproductive device for rapidly standardized communication across vast distances, was invented in the mid-nineteenth century. The imaginary surrounding transportation was forever altered as soon as Samuel F.B. Morse grafted verbal communication onto a series of dots and dashes in 1844. Although the construction of cables was physically tangible, sending code through electricity began dematerializing processes of transportation and communication. By the 1850s, when the silken *Washington* portrait was constructed and carried across the ocean, the telegraphic technology was solidly integrated into the communicative environment on both sides of the Atlantic. The telegraph would not unite America with Europe until 1858, but was readily present when the *Washington* was made, transported, and displayed. It comes as no surprise, then, that C.S. Goodrich described his process of transporting the Jacquard-woven image of *Washington* as an act of '*transmission.'* Goodrich phatically linked transportation to a telegraphic process by grafting his physical actions onto a burgeoning form of coded communication. Although there is no evidence Goodrich was communicating by telegraph or even perceiving himself as analogous to the telegraph, his action snevertheless gesture towards a desire to transmit, rather than transport, images.

Art historians, media theorists, and literature scholars have begun exploring the telegraph's role in producing meaning during modernity, often highlighting its cosmic impact on communication's eventual

dematerialization and instantiety.[81] As Jennifer Roberts has argued about the epistemic shift caused by the integration of the telegraph in transatlantic image cultures: "[before the integration of the telegraph] the words transportation and communication were effectively synonymous." After, writes Roberts, "the process of long-distance communication was dissociated from the physical movement of material bodies, and the two concepts diverged."[82] Images were ultimately resistant, or "nonconductive" to use Roberts' terminology, to the telegraph's electronic transmission patterns because images were resistant to Morse Code. Despite the telegraph's radical reorganization of spatiotemporal syntax, pictures were non-conductive to the telegraph's synchronous forms of connectivity.[83] Roberts' argument holds when considering the transportation of the Jacquard woven portrait: the woven *Washington* was indeed not sent through the telegraph. For all intensive purposes, however, the woven image possessed the feasibility of being transmitted through the telegraph's threads.

Had C.S. Goodrich obtained the punch-card code from the French, the code could have easily been sent across a telegraph cable. The sequence of holes representing *Washington* and the tool for his inception in silk therefore had the ability to be transported across the Atlantic in immaterial form. That is, the code itself could have been translated into Morse code, sent throughout the telegraph, recepted, translated, punched into another punch-card pattern, and then woven upon another Jacquard loom. As long as the geographically distant receiver had the exact same technology, and, by this time in America the Jacquard loom had certainly become common within the carpet industry, someone could have theoretically made another set of punch cards and re-woven the *Washington*. The punch card pattern itself, a replicable paper object which produced reproductive silken objects, could have been transmitted synchronically across land in 1855, and, by 1858, across the Atlantic to North America.

This theoretical transmision did not happen. It was likely not even conceived as an idea, for the goal of Messrs. Ponson, Phillippe, & Vibert and C.S. Goodrich was to generate a visually striking image of George Washington *in silk.* Despite the woven *Washington*'s epistemic feat highlighted in chapter 2, the image in fabric

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[81] For Example, see Richard Menke, *Telegraphic Realism: Victorian Fiction and Other Information Systems* (Stanford, CA: Stanford University Press, 2008), Lisa Gitelman. *Scripts, Grooves, and Writing Machines : Representing Technology in the Edison Era*. (Stanford, California; Stanford University Press, 1999.), and Richard Taws, "The Telegraph of the Past: Nadar and the Time of Photography" In *Photography and Other Media in the Nineteenth Century*, edited by Nicoletta Leonardi and Simone Natale. (University Park, Pennsylvania: The Pennsylvania State University Press, 2018.)

[82] See both Jennifer L, Roberts, "Post-telegraphic Pictures: Asher B. Durand and the Nonconducting Image." *Grey Room*, no. 48, 2012, 12-35 and Jennifer L.Roberts, *Transporting Visions : The Movement of Images in Early America*. Chapter 3. (Berkeley: University of California Press, 2014.)

[83] Ibid.

form could not travel through the cables of the telegraph. Although the new cabled communication technologies gestured towards an annihilation of space compatible with our contemporary virtual world, images in the nineteenth century were manipulated through distinct mechanical maneuvers, physically transmitted across vast expanses of land, and viewed within defined cultural infrastructures. Despite the Jacquard loom's ability to translate through code, the silk image of Washington had to be carried out of the factory, onto a boat, and across the Atlantic by Goodrich. Perhaps form was indeed becoming "divorced from matter" due to the amount of images produced by reproductive processes, but images were ultimately reliant upon physical transportation to ensure their transmission across geographic space.[84]

C.S. Goodrich's' telegraphic transmission was never actualized. The relationship between the Jacquard loom and the telegraph can be further entangled, however, when considering how the former paradoxically contextualized the later. Beyond semantics, both reproduction technologies copy meaning by reading codes and manipulating threads. According to the delinations of anthropologist Tim Ingold, traces represent enduring marks left in or on a solid surface by a continuous movement between maker and surface, while threads are filaments of some kind suspended between points in three-dimensional space.[85] Whereas the Jacquard loom weaves threads together to create surfaces, telegraphs send electric signals through threads to make traces on paper. These material links create a circuit of materiality between the loom and telegraph to suggest a binding correlation across infrastructure and meaning making.

Beyond the desire to copy through code, the Jacquard loom's specific tooling of the binary punch card drastically altered the hardware of the telegraphic system. In *American Artisan*, under their fifth installment of 'The Progress of the Telegraph,' Charles Wheatstone's updated telegraph was called an "electrical Jacquard."[86] As described, Wheatstone added a perforation machine to decrease the time necessary to translate words into Morse code. To obviate the need for slow human translators, Wheatstone used punch cards as an "analogous means to the mechanism of a Jacquard loom."[87] The "dot-and-dash" code of the Morse alphabet corresponded to the holes in the

[84] Oliver Wendell Holmes, "The Stereoscope and the Stereograph," *Atlantic Monthly*, June 1859, 737.
[85] Tim Ingold, *Lines : A Brief History* (London ; New York: Routledge, 2007.)
[86] "Popular Scientific Miscellany," *American Artisan : A Weekly Journal of Arts, Mechanics, Manufacturers, Engineering, Chemistry, Inventions, and Patents,* 19, no. 10, Oct 01, 1875, 264.
[87] Ibid.

perforated Jacquard ribbon allowing the time spent translating to decrease rapidly (Figure 3.2).[88] Holes were punched and then read as electric signals, thereby becoming telegraph translators and operators. As this examples denotes, the preparation, storage, and transmission of meaning was figured through the punching of holes, that, interesting enough, also worked through threaded cables. Connecting the Jacquard loom with the telegraph, the punch card technology stands in as the signifier connecting the history of images with the history of synchronic communication.

By 1875, it appears that the Jacquard loom was a device which figured individuals' explanations of other technologies while simultaneously increasing the speed of programmatic forms of communication across geographic distances. Inventors attempting to alter the speed of information across space turned to the Jacquard loom's perforated technology for speed and standardization. Importantly, this semantic and technical relationship garnered between the Jacquard loom and telegraph continued throughout in the nineteenth century with the advent of Herman Hollerith's census calculation machine, and, much later, the IBM processor.[89] As Wheatstone's device attests, the code-making of the Jacquard loom became an interchangeable tool used across reproductive machinery. Indeed, the relationship between the two reproductive machines therefore addresses more than mere a history of image synthesis, but the history of synchronic communication and calculation.

Silkenness

Despite its potential for telegraphic transmission, C. S. Goodrich's material transportation of the woven *Washington* was burdened by its silkenness -- illegible to fracture time and meaning through the telegraph's electrically charged cables. Silk's structure demanded a physical transportation with puritan care across the Atlantic. When Goodrich finally brought the image to America sometime around 1855, the silkenness of the loomed object was accepted into a pre-existing system of spectatorship. The *Washington's* presentation, reception, and translation ensured not only its status within the category of art, but its status as a good loaded with global implications. These strategies of presentation are important in understanding how the *Washington* inhabited two domains respectively: reproductive object and singular artistic achievement. The interface for viewing the uniquely made

[88] Ibid.
[89] Geoffrey Austrian. *Herman Hollerith, Forgotten Giant of Information Processing*. (New York: Columbia University Press, 1982).

Washington and the rhetoric surrounding its acceptance fits categorically within a diplomatic sphere of mid-century America, one concerned with simultaneously becoming global while celebrating national aspirations of economic and territorial expansion. This space, partial to the presentation of images of American prowess, warmly greeted the silken image despite its obvious connections to mechanical reproduction and the homespun. Taking into account the manifold avenues the image was framed through political, material, and spatial agents, we will see how the object rejected its own reproductive origins and associations with the homespun in favor of a more 'Artful' status imbued with nationalistic fervor.

The limited circulation story of this object has particular valence when considering the relationship between image and reproducibility in the nineteenth century. Art historians have introduced mobility and circulation as key components to understanding a work of art's valence in the ever changing, navigationally challenging, nineteenth-century transatlantic world. Jennifer Roberts and others have interrogated how art objects are always tethered to their materiality, beholden to the routes in which they travel and are presented. Inside each picture's visual plane, Roberts argues, the arc of transmission is iconographically pre-registered.[90] For instance, Gilbert Stuart's *Washington* secured its circulation across the Atlantic by representing an important figure in American culture. As many art historians have argued, the chain of replication for Gilbert Stuart's iconic portrait was embedded in its origin.[91] Stuart purposefully made the image iconic, blatantly ignoring the actual physical features of George Washington to ensure the image was easily copyable and recognizable for all resulting portraits. Indeed, Thomas Welch would not have reproduced the image had it not been an already-agreed upon image of an important figure. Through Stuart's brushstrokes, *George Washington* pre-registered its eventual replication and movement across the Atlantic Ocean, self-reflexively embodying its many transmissions in paper and eventual instantiation in silk.

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[90] Jennifer L.Roberts, *Transporting Visions : The Movement of Images in Early America*. Chapter 3. (Berkeley: University of California Press, 2014.)

[91] On Gilbert Stuart's Washington portraits see: Egon Verheyen, "'The most exact representation of the Original,': Remarks on the Portraits of George Washington by Gilbert Stuart and Rembrandt Peale," *History of Art,* 20 (1989): 127-140, Carrie Rebora Barratt and Ellen G. Miles, *Gilbert Stuart* (The Metropolitan Museum of Art ; New York, 2004), Maggie Cao, "Washington in China: A Media History of Reverse Painting on Glass." *Common-place.org,*15:4, (Summer 2015), and Adam Greenhalgh, "Not a man but a God" - The apotheosis of Gilbert Stuart' s Athenaeum portrait of George Washington," *Winterthur Portfolio*, 41:4, 2007.

It would be wrong to assume that the image had no part in securing its limited circulation. Yet, once the image of *Washington* was woven, does the copied image of Washington truly have the "self absolute, self-reflexive, and self-sufficient totality, which pre registers the imaged curve of its own movement?"[92] With certain objects, so says François Brunet in a critique of Robert's neo-Greenbergian argument concerning paintings, it is important to not neutralize more mundane circulation. Brunet advocates being attentive of what he refers to as "the a-pictorial approach to circulation," an approach concerned with how an image as an object travelled without the conceptual weight of its picture.[93] With this cautionary note in mind, the Jacquard-woven portrait demands a more inclusive theorization around its circulation. I would argue that it was the working relationship between substrate and image that secured the particular making, transmission, and reception of the woven *Washington*. Moreover, we can understand the silken object's particular circulation by treating its technological making, in this case the punch-card code, as a concept that travelled (or did not travel) along with the image.

What Was

The circulation of the *Washington* was inherently limited. According to some accounts, the weaving process took over two years to make. Likewise, the silk and production costs were somewhere between 15,000 and 20,000 dollars per woven image.[94] That Goodrich received even 4 editions of the silken *Washington* was an extravagant gift which demanded an excessive appreciation upon his arrival. Combining art with mechanism, the woven *Washington* was hailed as a crowning gift of the French's technical prowess and undying support for Washington's country. According to one reporter, viewers admired the object because it was, "both a truthful copy from Stuart's head of the illustrious subject, and for its extraordinary artistic excellence."[95] Viewers contextualized the object for its material and its ability to preserve the ideal of President Washington in a technically enchanting manner. The New York commemoration ceremony, in particular, represents the ideologies embedded within the

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[92] François Brunet. "Introduction : No Representation without Circulation ." In *Circulation*, edited by François Brunet. (Chicago: Terra Foundation for American Art, 2017.)
[93] Ibid
[94] "Valuable Present from France to the City of New York." *The National Magazine: Devoted to Literature, Art, and Religion,* 1855, 479.
[95] "Lyons To New-York" :Presentation of a Silk Manufactured Portrait of Washington." *New York Daily Times,* September 14th, 1855, 3.

object's reception to an American population. By studying the "end-points" of the image's circulation, we see how both the image and material technology secured a specific reception in an rapidly evolving American landscape.

The presentation of the silk-wrought *George Washington* at the New York City mayoral office was a highly staged affair. A large assemblage of "private citizens and public officials were present and expressed in unequivocal terms their admiration of the likeness."[96] C.S. Goodrich, after "the usual preliminary hems and haws upon such occasions," held the woven portrait in his hand as he delivered a passionate address for the curious audience. Describing the making process in its entirety, Goodrich was careful to illustrate that the city of Lyons, "works seventy thousand looms, and gives employment to nearly two hundred thousand artizans." Likewise, to further highlight the importance and global reach embedded within the silk-wrought object, Goodrich noted that, "the raw silk is brought from India, Africa, Italy, and the South of France."[97] Raw silk was a highly special material and has been traded throughout history as a luxury good due to its intricate extraction and refinement processes.[98] Messrs. Ponson, Phillippe, & Vibert are documented as owning a factory for silk extraction in Algeria. thereby implicating the woven *Washington* in Imperialism's ongoing process of the uneven extraction of resources.[99] These Imperial connotations, laden with associations of excotism, territorial expansion, and material prosperity, provided the necessary global rhetoric of an image seeking to secure a partnership between two nations. That France supported the territorial and economic expansion of the United States at mid-century is further telling of this ongoing relationship bounded by the exchange of exploited resources. [100] Moreover, silk's illustrious qualities set it apart from other forms of fibrous materials like cotton. Whereas cotton was a popular good produced in the United States, silk was solely an imported material throughout the eighteenth and nineteenth centuries. Without the climate necessary for silk production and without an overseas empire, Americans were bound to import silken objects from other countries.[101]

Weaving together a growing nation, the silken *Washington* combined its imperial materialism and

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[96] "A Present to the City," *New-York Daily Tribune,* September 14th, 1855.
[97] "A Present to the City," *New-York Daily Tribune,* September 14th, 1855.
[98] Jacqueline Field, Marjorie Senechal, and Madelyn Shaw, *American Silk, 1830-1930 : Entrepreneurs and Artifacts*. (Lubbock, Texas: Texas Tech University Press, 2007.)
[99] *Tableau de la situation des établissements français dan l'Algérie,* Volume 2, 1853.
[100] Kathryn C. Statler, "U.S.-Franco Relations." *Oxford Research Encyclopedia of American History,* 2016. Accessed 26 Mar. 2019. http://oxfordre.com/americanhistory/view/10.1093/acrefore/9780199329175.001.0001/acrefore-9780199329175-e-372.
[101] Jacqueline Field, Marjorie Senechal, and Madelyn Shaw, *American Silk, 1830-1930 : Entrepreneurs and Artifacts*. 2007.

nationalist imagery to concertize its reception within a distinct sphere of fine art. As the mayor of New York stated in his speech, "[the weavers] have procured as faithful a portrait of the lineament of the face of that great and good man, as at once to evince their unsurpassed skill, and at the same time exhibit the perfection of to which this department of art has been brought in this city of his birth, life, and death." Speaking on behalf of his citizens, the mayor promised viewers and readers alike that the portrait was of "*our* Washington." With national pride he insisted, "This picture, so beautifully woven and combining, as it were, art with mechanism, cannot but command the wonder and admiration of the many hundred thousands of our countrymen who will hereafter view it."[102] Although the mayor responded as if the image belonged to the entire nation, he ultimately kept the portrait in his office, firmly securing its position within a private sphere reserved for white, wealthy male viewership. Indeed, the woven *Washington* became legibly artistic, and thereby an object worthy of national praise, through its Presidential image and worldly silkenness.

The image and substrate therefore ensured the woven *Washington* was viewed as a work of art celebrating America's growth territorially and economically. According to one article, "The portrait will be hung up...amidst the splendid collection of paintings for the great *men* of this country whose fame has spread throughout the whole *civilized* world, and reflected honor upon themselves and the hand to which they owe their birth." Just like the original Stuart painting, the woven *Washington* was mounted vertically on a wall in a, "gilt frame, surmounted with an eagle."[103] This object was thus presented as a painting or single-sided print, flattened materially and theoretically to the ontological space reserved for unique works of art which celebrated America's success in diplomacy, global trade, and democratic vision.

What Was Not

This section has largely paid attention to the various ways the woven portrait was ideologically and materially framed after its limited circulation. As we have seen, both image and substrate worked to position *Washington* as an object d'arte - celebrating the global and territorial expansion sponsored by the French. Framing the object through these strategic maneuvers, however, meant that certain opportunities for contextualization were

[102] "A Present to the City," *New-York Daily Tribune,* September 14th, 1855.
[103] Ibid.

completely disregarded. For example, the Jacquard loom's status as a machine meant for replication and reproduction was dismissed even though it was a well known fact that industrial growth in western countries was garnered around the labor of fabric making. Indeed, the mechanization of reproductive fabric processes through the Jacquard harness was an extensive contribution to economic advancement in western capitalist societies. Many of the world fairs and large exhibitions throughout the nineteenth century, featured the Jacquard loom as an object of particular technological significance (Figure 3.3).

While it is unknown how the cities of Philadelphia and Boston responded to their copy of the woven *Washington*, viewers were likely aware of the importance of the Jacquard loom to their local economies. In Philadelphia, for instance, the making of the silken *Washington* was announced prior to its making. In fact, Philadelphian citizens saw "Specimens [of the Jacquard loom]...at the rooms of the American Institute."[104] As this brief report makes clear, viewers in mid-nineteenth century urban centers knew of the Jacquard's loom importance and anticipated seeing their first President wrought in silk. How viewers made the distinction between the image of *Washington* and other Jacquard-woven goods is unknown. Nevertheless, the Jacquard loom had certainly infiltrated the United States economy since its introduction in the 1830s. For instance, Philadelphia's nineteenth ward was lauded for having, "more manufacturaries than in any other manufacturing section of the same proportion of the world...The principal business in the ward [was] that of carpet manufacturing. The number of Jacquard looms was between 8,000 and 9,000 while the capital invested is nearly 30,000."[105] The woven *Washington* would have been associated and contextualized by the public as reproductive.

Likewise, viewers could have compared the object to other popular forms of making threaded images in and outside of manufacturing centers. Before and after the introduction of the Jacquard process, there existed a large practice of homespun weaving throughout the United States.[106] The practice of making coverlets, in particular, played a role in the dissemination of technologies such as the Jacquard loom. American coverlet making was a common practice throughout the eighteenth and nineteenth centuries, primarily concentrated in rural areas.[107] By the

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[104] "Portraits Woven in Silk," Transactions of the American Institute of the City of New-York, No 144, Volume 13.
[105] Ibid.
[106] Laurel Thatcher Ulrich, *The Age of Homespun : Objects and Stories in the Creation of an American Myth* (New York: Alfred A. Knopf, 2001.)
[107] Clarita Anderson. *American Coverlets and Their Weavers : Coverlets from the Collection of Foster and Muriel McCarl* (Williamsburg, Va.: Colonial Williamsburg Foundation in association with Ohio University Press, Athens, 2002.)

1840s in America, coverlet making used the same technology as the woven *Washington*. A Jacquard-woven coverlet made by James Cunningham in New Hartford, New York illustrates similar ambitions as the *Washington* portrait (Figure 3.3). The fabric object illustrates a repeating pattern of decorative embellishments and nationalist icons. On the border of the coverlet are splayed bald eagles and and outline of George Washington riding horseback (Figure 3.4). Woven in 1847, almost a decade prior to the *Washington* portrait, this patterned portrait reveals an interconnected and innovative reliance upon the global exchange of the Jacquard punch-card codes. Much like the woven *Washington*, this coverlet is an example of a creative appropriation. Homespun Jacquard weavers often imitated European patterns: "Even the general Washington on Horseback pattern is a copy of the french Jacquard pattern of Napoleon on Horseback. If the homespun weaver got the patterned design of the Napoleon, they would only have to edit the facial features."[108] Homespun weavers participated in global networks by circulating punch-card codes. They not only manipulated the technology of the Jacquard loom, but actively used it to make homespun objects for mass consumption.

Unlike the global circulation of Cunningham's Napoleon-turned-Washington punch-card code, the 'code-image' of the *Washington* portrait was not accessible to its American viewers. That Messrs. Ponson, Phillippe, & Vibert's *George Washington* punch-card code was *not* circulated with the image is further telling of its ambitions as a national piece of fine art. The woven image's flattening behind the glass confirmed that viewers saw it *not* as an image of homespun reproducibility, but as a *singular* copy of Stuart's *George Washington*. Indeed, the french-made *Washington* abandoned the possibility of being circulated within a sphere of homespun craft, one often associated with criminality and femininity, for a life lived as an object for the "country*men.*"[109] Although viewers were readily equipped to understand the object as mechanically reproductive and homespun, the silken singularity of the object secured its place within an limited sphere of viewership. Whereas Cunningham's coverlet embraced a utilitarian, reproductive process for patriotically representing Washington, the woven *Washington* rejected its potential reproductive fecundity for a singular existence.

Much as it rejected its telegraphic potential, Messrs. Ponson, Phillippe, & Vibert's *Washington* relied upon its technological enchantment, meticulously copied image, and global substrate to establish its own particular

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[108] Ibid
[109] "A Present to the City," *New-York Daily Tribune,* September 14th, 1855.

singularity in an image economy flooded with representations of Washington and other Jacquard-woven goods. Although the woven *Washington* manipulated the same technology as Cunningham's coverlet, the striking similitude of the woven image of America's first president secured its limited circulation. Likewise, the silkeness of the object secured viewers contextualized its value as well as its global reach. Rejecting the possibility for multiple circulations as well as its connectivity to amatuer forms of making, the woven *Washington* rose to the ambitions of a singular work of art rather than utilitarian object. Beholden to a pre-existing set of associations surrounding the status of reproduction in the nineteenth century, *Washington* was contextualized within a larger media landscape. The ability to simultaneously perceive a global reach and patriotic icon established this object not only as a testament of the French nation's technical prowess and undenying support of the United States, but an image of fine art.

Figures:

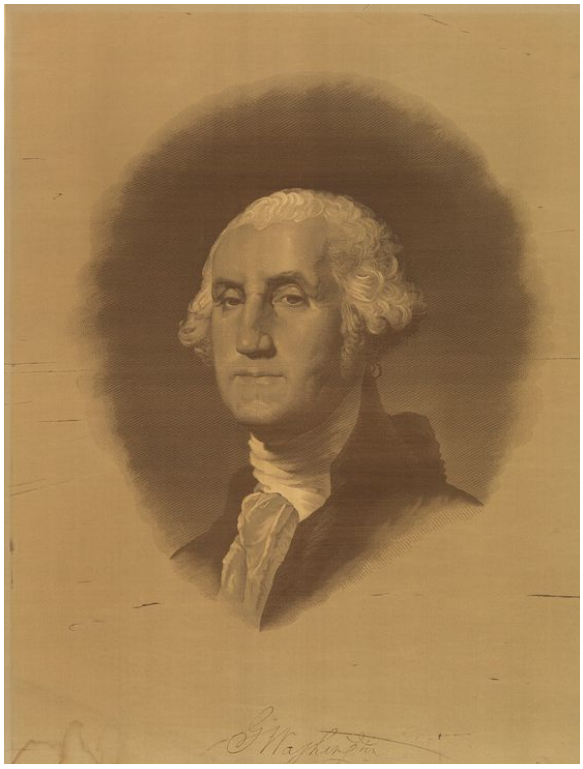

Figure 3.1. Messrs. Ponson, Philippe, & Vilbert. Jacquard-Woven Portrait of George Washington, 1855.

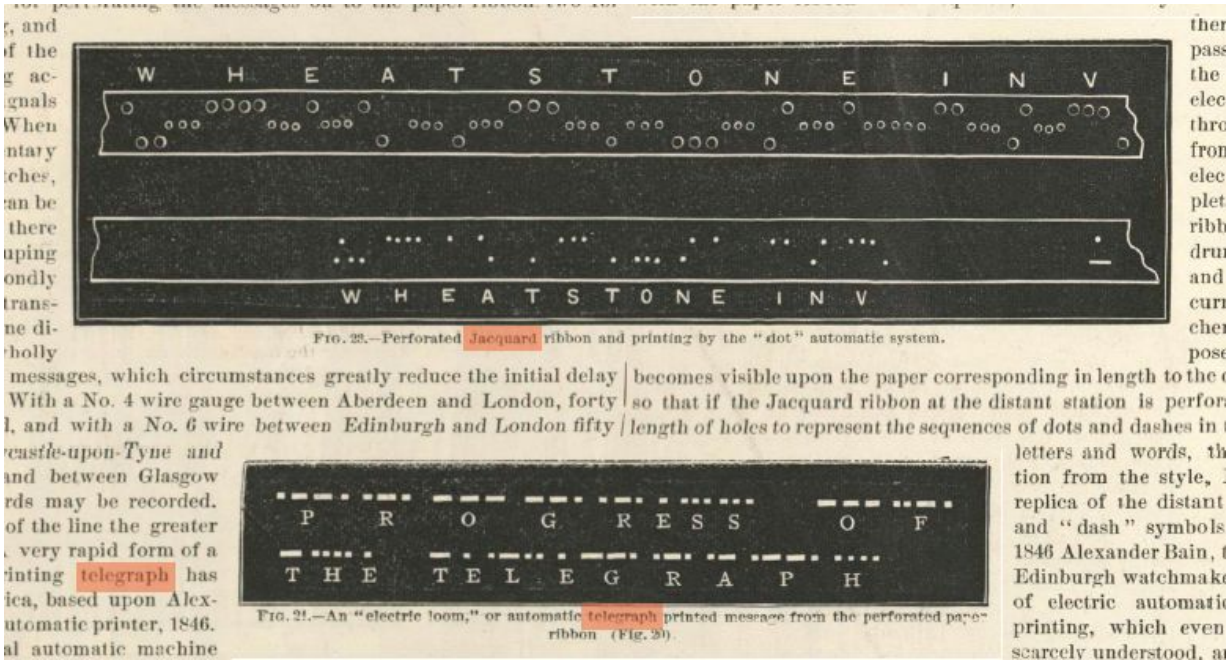

Fig. 23.—Perforated Jacquard ribbon and printing by the "dot" automatic system.

messages, which circumstances greatly reduce the initial delay becomes visible upon the paper corresponding in length to the
With a No. 4 wire gauge between Aberdeen and London, forty so that if the Jacquard ribbon at the distant station is perfor
l, and with a No. 6 wire between Edinburgh and London fifty length of holes to represent the sequences of dots and dashes in
castle-upon-Tyne and letters and words, th
and between Glasgow tion from the style,
rds may be recorded. replica of the distant
of the line the greater and "dash" symbols
very rapid form of a 1846 Alexander Bain,
inting telegraph has Edinburgh watchmak
ica, based upon Alex- of electric automati
utomatic printer, 1846. printing, which even
al automatic machine scarcely understood. a

Fig. 24.—An "electric loom," or automatic telegraph printed message from the perforated paper ribbon (Fig. 23).

Figure 3.2. Perforated Jacquard ribbon and printings by the "dot" automatic system and the printed message from the perforated

paper ribbon. In “Popular Scientific Miscellany,” *American Artisan : A Weekly Journal of Arts, Mechanics, Manufacturers, Engineering, Chemistry, Inventions, and Patents,* 19, no. 10, Oct 01, 1875, 264.

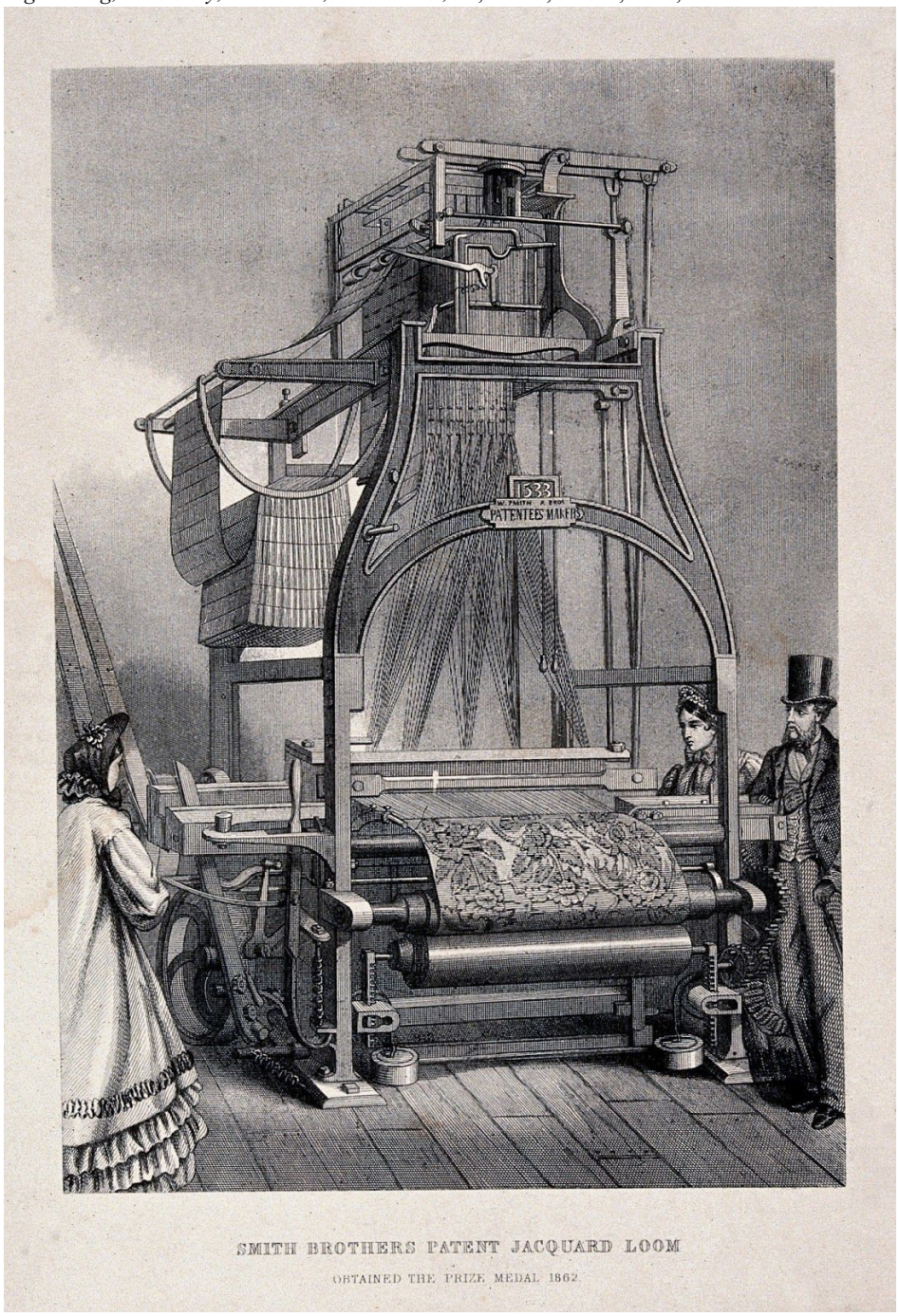

Figure 3.3. Smith Brothers Patent Jacquard Loom, Obtained the Prize Medal in 1962. Wellcome Collection Print. https://wellcomecollection.org/works/rrqs9wgs

Figure 3.4. James Cunningham. Woven Coverlet, Coverlet, 1847. American Textile Museum.

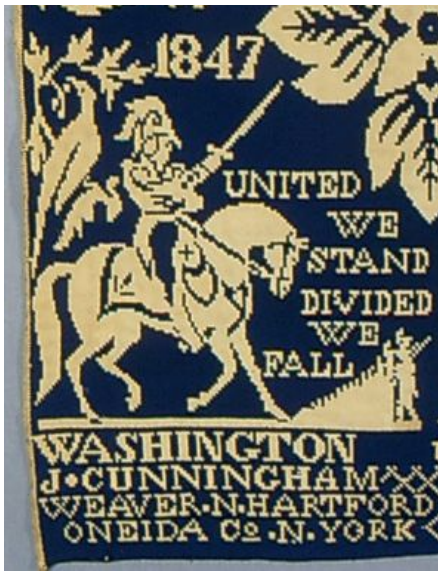

Figure 3.5. Detail of Cunningham's Woven Coverlet.

Coda

Artist Analia Saban wove together dried strips of black acrylic paint and linen thread into *Computer Chip, TMS 1000, Texas Instrument, 1974* (figure 4.1) as this thesis was being written. In her ongoing practice, Saban weaves together dried paint with threads of linen to make the memory chip tapestry. The dried paint and threads of canvas are interlaced as substrate and medium. Far away, the hanging piece of cloth represents an important icon in the history of computers; move too close and representation is revealed to be pixelated stitches of the warp and weft. Defying easy classification, Saban's *Computer Chip* seductively weaves the history of modernism's gridded fantasies with the architecture of a memory chip, a crafted 'low' culture with the status of painting, and feminine labor with Minimalism's muted color palette. Concretizing the hardware of digitality in painterly terms, Saban's practice radically reorients the status of craft within an unbound history of technical, visual, and material relationships. It is perhaps Saban's work that positions this thesis as integral not only to our conception of the past, but to the present.

In this thesis, my intention has been to illustrate that the interactions between different reproductive mediums - photograph, print, fabric, and telegraph - were made manifest through a desire to translate, transform, and transmit particular images in the nineteenth century. Gilbert Stuart's famous *George Washington* served as the icon for a host of transnational experiments surrounding the relationship between objecthood and image in a quickly changing world. In narrating *Washington's* translation from painting to photograph, photograph to engraving, engraving to punch-card code, code to woven image, and woven image to frame, the Jacquard loom emerges as the key figure of synthesizing art history's reproductive media. By following the circulation of an image through various materialities, toolings, and maneuvers, this thesis has illustrated how the Jacquard loom synthesized and recontextualized pre-existing media. Additionally, I would note that although the influx of reproductive images in the nineteenth century provided a "new freedom of transposition, displacement, and transformation, of resemblance and dissimulation, of reproduction, duplication, and trickery of effect," these moments were always mediated.[110] Form was divorced from *specific* matter. Likewise, this expansive story revealed an ongoing network of

[110] Michel Foucault, "Photogenic Painting," in Gilles Deleuze and Michel Foucault, Gerard Fromanger: Photogenic Painting, (London: Black Dog Publishing, 1999.)

craftspeople, photographers, draughtsmen, card punchers, government officials working to alter image's surfaces. Destabilizing the idea of key figures in a history of art, I have attempted to use a low-def cast of characters to construct the ideological and material threads procured by the many translations of Gilbert Stuart's *George Washington*.

While keen attention has been given to the Jacquard loom as a machine for the synthesis of disparate forms of reproductive media, this thesis has also illustrated that threaded moments of interaction reveal larger historic paradigm shifts concerning an image's relationship to concepts of originality, communication, mobility, and labor. These shifts undoubtedly occurred in the nineteenth century through the intermedial interactions between forms of media. Chapter one claims photography and weaving were concretitzed as parallel processes of making through the logic of the *negative.* Working against the notion that the negative was a depraved form, this chapter illustrates that makers translated images across materials through the space offered by the negative. Thomas Welch's choice to reject the Daguerreotype's unique originality confuddled the stringent positive-negative reproductive binary, while Szczepanik's use of the negative allowed him to take the negative as a scannable language for transmitting images. Likewise, the visual equivalence between print and woven image was a nexus for illustrating how histories of craft labor reveal paradigmatic shifts in the history of vision. By attending to the ways in which the form of the grid structured and displaced labor, chapter two firmly connects the epistemic shift of the Jacquard's crafted tooling as an integral player in our contemporary relationship to images in a postmodern world. The third chapter took the semantics and rhetoric of the woven image's circulation as a method for evaluating both telegraphs and the critical tactics of framing within an hierarchical economy of images. The silkenness of the image - loaded with global implications - worked to negotiate a specific platform of viewing to disclose mass reproduction.

As my stray references throughout this thesis have suggested, my approach to the questions of reproduction, intermediality, and craft within the nineteenth-century transatlantic world have been shaped profoundly by the contemporary moment. Of course, the nineteenth-century networks surrounding woven images - the machines that made and altered them, the craftspeople who copied them, the inventors who attempted to combine them, and the people who carried them - are not the digital world we live in today. Yet, they too were thinking through circuits of relationality and threading together new ways of picturing. Moreover, and perhaps most importantly, this thesis advocates for a strategic presentism to address digital capitalism's guise of immateriality.

Much like the Jacquard-woven image, immaterial transactions of the digital world are all too reliant upon a network of threaded cables, circuit boards, and framed screens to project a perspective of unlimited manipulability and usability. Art historians, I believe, are particularly prepared to address the tactics of illusion happening in the contemporary moment.

Finally, underlying my observation is a key reliance upon the interrelated, but all-too often forgotten, relationship between the creation and alteration of surfaces of meaning through threads at the visual, material, symbolic, and informatic level. In discussing how technological objects can serve as a metonym of technological systems, theorist Gilbert Simondon writes, "It would not be an exaggeration to say that the quality of a simple needle expresses the degree of perfection of a nation's industry."[111] Perhaps, too, it would not be an exaggeration to say that the crossing of threads expresses one important lineage in the history of images. As Simondon's technical material history attests, we as Art historians must place our seemingly static set of objects in systematic, infrastructural, and circuitous flows of material and knowledge. Elemental forms such as thread, I suggest, allow for extensive and expansive art historical arguments concerned with the history of picturing. Much as Analia Saban's work holds together the presentation of the memory of making, I suggest we must weave threads and perforate surfaces in art's mediated history.

[111]Gilbert Simondon, *On the Mode of Existence of Technical Objects*, trans. Cé cile Malaspina and John Rogove (Minneapolis, 2017) 73.

Figure 4.1. Analia Saban. *Computer Chip, TMS 1000, Texas Instrument, 1974.* Dried Acrylic and Linen, 2018.

Extended Bibliography

Adamson, Glenn. *The Invention of Craft*. London ; New York: Bloomsbury Academic, 2013.

Adamson, Glenn. *The Craft Reader*. Oxford ; New York: Berg Publishers, 2010.

Anderson, Clarita. *American Coverlets and Their Weavers : Coverlets from the Collection of Foster and Muriel McCarl.* Williamsburg, Va.: Colonial Williamsburg Foundation in association with Ohio University Press, Athens, 2002.

Appel-Heyne Odette M., Charles R. Moore, and Robert A. Sobiesze. *The Daguerreotypes of Southworth & Hawes*. New York: Dover Publications, 1980.

Austrian, Geoffrey. *Herman Hollerith, Forgotten Giant of Information Processing*. New York: Columbia University Press, 1982.

Bann, Stephen. *Parallel Lines: Printmakers, Painters and Photographers in Nineteenth-Century France.* New Haven: Yale University Press, 2001, 8-11.

Barrat, Carrie Rebora and Ellen G. Miles. *Gilbert Stuart.* New York: The Metropolitan Museum of Art, 2004.

Bellion, Wendy. *Citizen Spectator: Art, Illusion, and Visual Perception in Early National America*, Chapel Hill, North Carolina: University of North Carolina Press, 2011.

Benjamin, Walter, "The Work of Art in the Age of Its Technological Reproducibility [Second Version]," in The Work of Art in the Age of Its Technological Reproducibility and Other Writings on Media, ed. Michael W. Jennings, Brigid Doherty, and Thomas Y. Levin. Cambridge, MA: Belknap Press, 2008 .

Berg, Maxine. *The Machinery Question and the Making of Political Economy 1815-1848. New York: Cambridge University Press, 1980.*

Bertholon, Pierre. *Du commerce et des manufactures distinctives de la ville de Lyon*. Montpellier, Jean Martel Aîné, 1787.

Blum, Herman Blum. *The Loom Has a Brain: The Story of the Jacquard Weaver's Art*. Philadelphia, PA: Craftex Mills, Inc., 1958.

Bowyer, Emerson. "Editor's Introduction Multiplying the Visual: Image and Object in the Nineteenth Century." *Grey Room*, no. 48 (2012): 6-11. http://www.jstor.org/stable/23258333.

Brunet, François. “Introduction : No Representation without Circulation.” In *Circulation*, edited by François Brunet. Chicago: Terra Foundation for American Art, 2017.

Caffentzis, George. *In Letters of Blood and Fire : Work, Machines, and the Crisis of Capitalism*. Oakland, California: Autonomedia, 2013.

Crary, Jonathan, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century.* Cambridge, MA: MIT Press, 1990

Ernst, Wolfgang. “Let There Be Irony: Cultural History and Media in Parallel Lines,” *Art History*, 28: 582-603

Essinger, James. *Ada’s Algorithm : How Lord Byron’s Daughter Ada Lovelace Launched the Digital Age*. Brooklyn: Melville House, 2014.

Essinger, James. *Jacquard’s Web : How a Hand-Loom Led to the Birth of the Information Age*. Oxford ; New York: Oxford University Press, 2004.

Fernaeus, Ylva, Martin Jonsson, and Jakob Tholander. “Revisiting the Jacquard loom: threads of history and current patterns in HCI.” In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, New York, NY, USA, 2012.

Foucault, Michel, "Photogenic Painting." in Gilles Deleuze and Michel Foucault. Gerard Fromanger: Photogenic Painting, London: Black Dog Publishing, 1999.

Gaboury, Jacob. “Hidden Surface Problems: On the Digital Image as Material Object.” *Journal of Visual Culture* 14, no. 1 (April 2015): 40–60.

Gillespie, Sarah Kate. *The Early American Daguerreotype : Cross-Currents in Art and Technology*. Cambridge, Massachusetts: MIT Press, 2015.

Gitelman, Lisa. *Scripts, Grooves, and Writing Machines : Representing Technology in the Edison Era*. Stanford, Calif.: Stanford University Press, 1999.

Greenhalgh, Adam, "Not a man but a God" - The apotheosis of Gilbert Stuart' s Athenaeum portrait of George Washington,” *Winterthur Portfolio*, 41:4, 2007

Grigsby, Darcy Grimaldo Grigsby. "Negative-Positive Truths." *Representations*. 113, no. 1 (2011.)

Hayles, N. Katherine. "Print Is Flat, Code Is Deep: The Importance of Media-Specific Analysis."*Poetics Today,* 25, no. 1 (2004): 67-90.

Higgins, Hannah. *The Grid Book.* Cambridge, Mass.: MIT Press, 2009.

Holmes, Oliver Wendell. "The Stereoscope and the Stereograph," *Atlantic Monthly*, June 1859, 737

Ingold, Tim. *Lines : A Brief Histor*y. New York: Routledge, 2007.

Ivins, William. *On the Rationalization of Sight, with an Examination of Three Renaissance Texts on Perspective.* Da Capo Press, 1973.

Jaffee, David. *A New Nation of Goods: The Material Culture of Early America.* University of Pennsylvania Press, 2010.

"Jacquard Loom," *Dead Media Archive*, Spring, 2010, accessed March 24th, 2019. http://cultureandcommunication.org/deadmedia/index.php/Jacquard_Loom

Menke, Richard. *Telegraphic Realism: Victorian Fiction and Other Information Systems.* Stanford, CA: Stanford University Press, 2008.

Kittler, Friedrich. *Gramophone, Film, Typewriter*. Stanford, Calif.: Stanford University Press, 1999.

Kittler, Friedrich. *Optical Media : Berlin Lectures 1999*. Cambridge, UK ; Malden, MA: Polity Press, 2010.

Leja, Michael. "Fortified Images for the Masses." *Art Journal* 70, no. 4 (Winter, 2011): 61-83.

Leja, Michael. "Issues in Early Mass Visual Culture," in John Davis, Jennifer Greenhill, and Jason LaFountain, eds., *A Companion to American Art*. Malden, Mass.: John Wiley & Sons, 2015, 507–24.

Leja, Michael, "Scenes from a History of the Image," *Social Research* 78, no. 4 (2011): 999–1028

Leonardi, Nicoletta, and Simone Natale. *Photography and Other Media in the Nineteenth Century*. University Park, Pennsylvania: The Pennsylvania State University Press, 2018.

Cao, Maggie. "Washington in China: A Media History of Reverse Painting on Glass." *Common-place.org,*15:4, (Summer 2015).

Manovich, Lev. *The Language of New Media*. Cambridge, Mass.: MIT Press, 2001.

Miller, Peter N. Cultural Histories of the Material World. Ann Arbor: The University of Michigan Press, 2013.

Millet, Audrey. “Factory Draughtsmen in Eighteenth- and Nineteenth-Century France.” *Biens symboliques / Symbolic Goods*, 2017. Accessed on March 24th, 2019. https://revue.biens-symboliques.net/106

Mitchell, William J. *The Reconfigured Eye: Visual Truth in the Post-Photographic Era*. Cambridge, MA: MIT Press, 1994, 6.

Moore, Charles Leroy. *Two Partners in Boston: The Careers and Daguerian Artistry of Albert Southworth and Josiah Hawes.* PhD Dissertation, University of Michigan, 1975.

Monteiro, Stephen. *The Fabric of Interface : Mobile Media, Design, and Gender*. Cambridge, Massachusetts: The MIT Press, 2017.

Parikka, Jussi. *What Is Media Archaeology?* Cambridge, UK: Polity Press, 2012

Roberts, JenniferL. “On Mis-Expertise: Writing About Making.” Minding Making, accessed March 24th, 2019, https://www.mindingmaking.org/project_misexpertise

Roberts, Jennifer L.. "Post-telegraphic Pictures: Asher B. Durand and the Nonconducting Image." *Grey Room*, no. 48 (2012): 12-35. http://www.jstor.org/stable/23258334.

Roberts, Jennifer L. *Transporting Visions : The Movement of Images in Early America*. Berkeley: University of California Press, 2014.

Romer, Grant B. and Brian Wallis. *Young America : The Daguerreotypes of Southworth & Hawes*. New York: George Eastman House, 2005.

Siegert, Bernhard, and Geoffrey Winthrop-Young. *Cultural Techniques : Grids, Filters, Doors, and Other Articulations of the Real*. New York: Fordham University Press, 2015.

Simondon, Gilbert. *On the Mode of Existence of Technical Objects*. trans. Cé cile Malaspina and John Rogove, Minneapolis, 2017, 73.

Steyerl, Hito. “Medya: Autonomy of Images” in *Duty Free Art.* New York: Verso, 2017

Statler, Kathryn. "U.S.-Franco Relations." *Oxford Research Encyclopedia of American History,* 2016.

Trachtenberg, Alan. “Photography: The Emergence of a Keyword,” in *Photography in Nineteenth-Century America,* ed. Martha Sandweiss. New York: Abrams, 1991, 17-45.

Verheyen, Egon. “‘The most exact representation of the Original,’: Remarks on the Portraits of George Washington by Gilbert Stuart and Rembrandt Peale,” *History of Art,* 20 (1989): 127-140.

Ulrich, Laurel Thatcher. *The Age of Homespun : Objects and Stories in the Creation of an American Myth*. New York: Alfred A. Knopf, 2001.

Primary Sources

"A Present to the City," *New-York Daily Tribune,* September 14th, 1855.

Babbage, Charles. *On the Economy of Machinery and Manufactures*. London: John Murray, 1846, 336-227.

Baker, William Spohn. *American Engravers and Their Works*. Philadelphia: Gebbie & Barrie, 1875, 175-17.

Bell, T.F., *Jacquard Weaving and Designing*. United Kingdom: Longmans, Green, and Co., 1895.

Boston Evening Transcript, December 16th, 1852.

Dallmeyer, Thomas Rudolphus. *Telephotography: an Elementary Treatise On the Construction And Application of the Telephotographic Lens.* London: W. Heinemann, 1899.

Electricity: A Popular Electrical Journal, Volume 14, June 8, 1898, 347.

"Has a Magic Loom: Vienna Wizard Makes a Wonderful Discovery." *Chicago Daily Tribune*, July 24, 1898.

Hawes, Josiah Johnson. "Stray Leaves from the Diary of the Oldest Professional Photographer in the World," *Photo Era: The American Journal of Photography, 16:2,* February, 1906. 104-107. Found in the Gary W. Ewer, ed., *The Daguerreotype: an Archive of Source Texts, Graphics, and Ephemera,* http://www.daguerreotypearchive.org.

Holmes, Oliver Wendell. "The Stereoscope and the Stereograph." *Atlantic Monthly*, 3, No. 20, June, 1859.

Journal of the Common Council, of the City of Philadelphia, September 13th, 1855. 518.

New-York Daily Tribune, Sept. 14, 1855. 7.

Pearson's Magazine, Volume 8, 1899, 496.

"Popular Scientific Miscellany." *American Artisan : A Weekly Journal of Arts, Mechanics, Manufacturers, Engineering, Chemistry, Inventions, and Patents.* Nno. 10, Oct 01, 1875, 264.

"Portraits Woven in Silk." Transactions of the American Institute of the City of New-York, No 144, Volume 13.

'Seeing by Wire." *Pearson's Magazine*, 1899, Early Popular Visual Culture, 6: 3, 305 — 312.

"Textile Designs by Photographic Methods," *Wilson's Photographic Magazine (1889-1914)*, Nov 01, 515.

"The Inconstant Daguerreotype." *Harper's Monthly*, 10, May, 1855, 824.

"The Photographic method of Preparing Textile Designs." *The American Architect and Building News,* 70, Oct 6, 1900, 6.

"The Production of Weaving Designs by Photography." *The Penrose Journal*, 1903-1904, 1-7/

"Weaving Industry Revolutionized," *Boston Daily Globe*, Dec 04, 1898, 25.