Cultural Techniques: Grids, Filters, Doors, and Other Articulations of the Real

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(Not) in Place

The Grid, or, Cultural Techniques of Ruling Spaces

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[−] Abstract and Keywords

The chapter aspires to describe some of the basic aspects of our media culture by pointing to the histories, interconnections and mutual translatability of imaging grid (as introduced by Alberti), cartographic grid (as introduced by Ptolemy), topographic grid (as put to use by early modern Spanish colonialism), speculative grid (as put to use by the land surveys of the early United States), and planning grid (as introduced by architects like Neufert and Le Corbusier in the twentieth century). Like in the case of the Renaissance grid that effectivelyc ombines an imaging process (Alberti's *velum*) with a topographical planning procedure (the colonial settlement of Latin America), it is the linking of representational and operative functions, which turns the grid into a formidable cultural technique. Linked with the convertibility of these diverse grids and with corresponding scaling techniques, grids have become the basis of a mediatization of space from which hardly anything can escape.

Keywords: Grid, Velum, Alberti, Geodetic Grid, Spanish colonial topography, Land survey, United States of America, Architecture

The Grid as Cultural Technique

Xenophon's *Oeconomicus* introduces *taxis* as a fundamental cultural technique of the economic domain. *Taxis* refers to an order of things in which each and every object is located in a fixed place where it can be found. Humans, however, differ from things. “When you are searching for a person,” Xenophon cautions, “you often fail to find him, though he may be searching for you himself.”[1] Humans defy the fundamental rules of economy because for them “no place of meeting has been fixed.”[2]

This distinction between retrievable things and untraceable humans points to the fundamental divide that separates the Greeks from modern subjects. Modernity is characterized by the invention of a *taxis* technique capable of also turning humans into retrievable objects. This modern *taxis* is implemented by means of a new cultural technique which takes into account that something may be missing from its place. In other words, it encompasses the notion of an empty space. The technique in question is the grid or lattice. Its salient feature is its ability to merge operations geared toward representing humans and things with those of governance. As Deleuze noted in his study of Foucault, between the sixteenth and eighteenth century, grid-shaped control becomes the universal practice that constitutes the basis of modern disciplinary societies.[3]

The ontological effect of the grid is the modern concept of place and being-in one's-place based on the media-theoretical distinction between data and addresses. In other words, it presupposes the ability to write absence, that is, to deal equally efficiently with both occupied and empty spaces. This concept of place is thus inextricably tied to the notion of order. In return, it is impossible to conceive of this modern concept of order without the new understanding of place.

(p.98) The universality of this concept of order is apparent in the way in which it bears on the interaction between imaging technologies and mathematical, topographical, geographical, and governmental knowledge. It is this interaction that turns the grid into a cultural technique. But what does this imply? As a cultural technique, the grid has a triple 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, 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. To speak with Heidegger, it is a *Gestell* or "enframing" aimed at the availability and controllability of whatever is thus conceived; it addresses and symbolically manipulates things that have been transformed into data. The grid, in short, is a medium that operationalizes deixis. It allows us to link deictic procedures with chains of symbolic operations that have effects in the real. Hence the grid is not only part of a history of representation, or of a history of procedures facilitating the efficient manipulation of data, but also of "a history of the different modes by which, in our culture, human beings are made into subjects."[4]

As important as the distinction between centrifugal and centripetal grids may be,[5] for the purpose of analyzing the grid as a cultural technique it is more relevant to distinguish between representational, topographic, cartographic, speculative, and three-dimensional (total) grids. This division, in turn, suggests a more fundamental question: Can the expansion of Western culture from the sixteenth to the twentieth century be described in terms of a growing totalitarianism of the grid?

Representational Grids

The fact that the grid effectively merges representation and operation is already apparent in Leon Battista Alberti's 1435 treatise *De pictura* (*On Painting*), which deals with grids as part of an imaging theory. Alberti's famous *velum* (veil) is a *perspectiva naturalis* technology designed to circumscribe objects (*circumscriptio*). Together with the window, which serves as metaphor for the mathematical construction of paintings, the veil is a medium for their technical construction. Alberti also refers to it as an intersection or *intercisio*, thereby **(p.99)** linking it to his definition of the image as an intersection of the visual pyramid. The veil

> [is] woven of very thin threads and loosely intertwined, dyed with any color, subdivided with thicker threads according to parallel partitions, in as many squares as you like, and held stretched by a frame, which [veil] I place, indeed, between the object to be represented and the eye, so that the visual pyramid penetrates through the thinness of the veil.[6]

Alberti's veil is the basis for all technological imaging procedures, until the twentieth century, that employ reprographic techniques such as hole patterns and halftone. Since the late nineteenth century, industrial graphics has used coded perforation patterns to resolve and make transmittable a template's half-tones. Thus the veil survives in today's screen printing technologies.

But already in the seventeenth century halftone techniques had been linked to a media-theoretical modeling of neuronal signal processing. The mezzotint print technology invented in 1642, which consists in wiping off the surface of a burnished copperplate,[7] corresponded to Descartes's physiological theory of the processing of optical perceptual data by their analytical decomposition into hole patterns that are engraved into the brain. But technical images do not have to wait for the arrival of copperplate engravings or the idea of neuronal signal processing by means of hole patterns; they precede the age of their technological reproducibility. Technical images, in other words, are no exclusive hallmark of modernity. The textile image was always already a technological image because it was produced by the mechanical distribution of warps and wefts.[8] It comes as no surprise that Alberti resorts to weaving and textile images when discussing the intricacies of central perspective. Indeed, at the beginning of the fifteenth century it was quite common in Europe—for instance, at the court of the Duc de Berry—to consider tapestries to have higher value than pictures. Alberti is so firmly rooted in the textile paradigm that his claim to have produced a scientific—that is, mathematical—treatise is constantly thwarted by explanations that harken back to the art of weaving. One example of many is his attempt to give a textile spin to Euclid's definition of a surface: "If more lines stick together like close threads in a cloth, they will make a surface."[9]

According to Alberti, the great asset of the veil is "that it always presents the same surfaces unchanged," because it fixes the apex of the visual pyramid. "And so, the veil will guarantee this not negligible advantage which I have spoken of: that the object always stays the same with respect to the view [ut res semper eadem e conspectu persistat]."[10]

(p.100) To grasp the ontological implications of Alberti's grid technique it is necessary to emphasize its connection to the categories of place or *locus* in his treatise:

> Since painting, in fact, aspires to represent the objects seen, let us note in what way they themselves come to sight. First of all, when we watch an [object], we certainly see that there is something that occupies a place.[11]

Something real (*res*) is something that occupies a space, that is in its place. It is crucial to be mindful of the connotations that the term *locus* (Greek *topos*) possesses in both rhetorics and *ars memoria*e. As Alberti would have it, only that which occupies its place is a representable object. Whatever lacks an identifiable place—such as the old gold ground or the halos that Alberti disdains—cannot and should not be depicted.[12]

Alberti's grid is an ordered space: a space in which aesthetic, ontological, and diagrammatic orders exercise their power over the existence and appearance of objects. It is a space that pays tribute to the power of cultural techniques to assign things and figures their own space. Hubert Damisch defined this "data space" as the "paradigmatic dimension" of the *costruzzione legitima*:

> To each figure its place: at each point on the underlying checkerboard, if not within each of its squares, one figure and only one, among all those that are possible, can be situated.[13]

Damisch makes clear that both the grid and the checkerboard of the *perpectiva artificialis* are structures in the Saussurean sense. The representation of objects in pictorial space implies their substitutability, which in turn reveals the analogy between Alberti's perspectival space and the place-value system of Indo-Arabic numerals. The fact that the grid precedes the object located therein (which implies both the possibility of addressing an empty place and the contingency of whatever object happens to be situated there) is equivalent to the semiotics of zero.[14] Brunelleschi as well as Alberti were members of that particular social class that in the *trecento* first absorbed and circulated knowledge of Indo-Arabic numerals. To each figure its own piece of space, to each numeral its place—in Germany, incidentally, these numerals were still known in the seventeenth century as *figurae.*

It is for this structural reason that digitization is able to retire the *velum*. Once you have two moveable scales and a sighting mechanism such as a cross-staff or a quadrant, a veil is superfluous (Figure 6-1).

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(p.102) The Cartographic Grid

Cartographers have used the grid as a technique for ordering space since antiquity. Claudius Ptolemy was the first to wrestle with the problem of projecting a spherical surface onto a plane surface; as well, he pioneered the method of dividing a surface into a lattice of latitudes and longitudes. In the second century he authored a treatise on cartography. His *Geography* was in all likelihood expanded by Byzantine scholars, and upon reaching Italy was translated into Latin in 1406. Ptolemy probably only wrote book 1, the beginning of book 2, and chapters 3 through 28 of the final book 8. The latter contains the coordinates of roughly three hundred cities based on time measurements. The longitude is determined by the temporal distance from the Alexandrian meridian, with one hour corresponding to fifteen degrees of longitude. The latitude is determined by the length of the longest day. The greater the distance from the equator, the longer the longest summer day in the Northern Hemi sphere.[15] Based on information provided by Ptolemy and the Byzantine additions, European publishers added maps to their editions.

Figure 6-1. Achieving perspective without the *velum*. Notice the *adlatus* on the floor, holding the grid in his hands, on which he enters the coordinates the artist-engineer is telling him.

Engraving, reprinted from Jacopo Barozzi da Vignola, *Le due regole della prospettiva pratica* (Rome: Stamparia Camerale, 1611).

The importance of the strict Euclidean ratio of point, line, and surface is already apparent in Edward Wright's map of 1599, which uses an improved Mercator projection to depict longitudes as parallels.[16] Latitudes and longitudes impose themselves on the medieval system of rhumbs. The grid thus turns into a diagram,[17] enabling the depiction of temporal sequences in addition to spatial orders. Once we read the synchronic segments diachronically, time appears as a function of space.

Ever since the arrival of matrix screens in the early 1970s, the addressing of points by means of rows and columns has turned into a universal imaging technique. While the imaging technique of vector graphics corresponds to the navigational technique of medieval portolan charts based on rhumb lines (a point is defined by its angle to and distance from the *origo*), the matrix screen corresponds to navigation by means of latitude and longitude. Unlike vector graphics that only store the beginning and end of a line, the matrix screen must take account of every single point on the line. The advantage of the latter is the addressability of every single element on the screen, because the screen memory delegates exactly one unit of storage space to each point.

The Topographic Grid (South America)

One of the effects of the representational technique known as central perspective is that the identity of objects becomes a function of their being in a particular place. The navigational technique employing latitude and longitude, in **(p.103)** turn, enables us to head for any point in space by means of addresses that precede all stored data. The overall result is a common paradigm of image construction and early modern colonial governmentality that far exceeds the boundaries of art. To put persons or things in their place, to objectify and subjugate them, are procedures Heidegger already detected in the term *repraesentare*.[18] Turning to the colonial topographies of Spanish-American settlements, we can see that they are superimposed on a grid of very different provenance: the checkerboard design of urban planning associated with Hippodamus of Miletus. The representational grid of the Renaissance decodes and recodes the early grid of colonial topography devised by antiquity.

What results from this superimposition of the representational on the urban grid? Colonialism unleashes and mobilizes the utopian social potential contained in the grid-shaped heterotopias of Latin America. Three aspects are of particular importance: a) the possibility of registering the absent; b) the distinction between data and addresses; and c) the potentially infinite extension in time and space. The latter marks a decisive difference between the grid of Spanish colonial topography and Alberti's veil: The contained *velum* is a figure, whereas the centrifugal orthogonal net of colonial settlements is not.[19] The grid is thus located at several junctions: It straddles the boundary between antiquity and the modern age, and it marks the transition from the political to the economic (or governmental) as well as from symbolically organized space to graphically coded surface.

The origin of Spanish-American checkerboard cities has been the subject of lengthy debates. In all likelihood they arose from medieval and early modern attempts to adapt the construction of Roman military camps. A medieval Spanish treatise on urban planning containing, among other items, the *Regiment de Princeps* by the Catalan Franciscan Francesc Eiximenis (app. 1340–1409), describes the ideal grid-shaped city.[20]

The Roman *castrum* reflects the practice of centuriation. Centuriation is the division of the land into square units called centuries, carried out by the *agrimensores*, the Roman land surveyors. The more Rome came to dominate Italy, the greater was the need to divide up public domains and found new colonies.[21] The only surviving official Roman survey maps are the cadasters of Arausio (Orange, Vaucluse); in addition, there is an extant collection of Roman land surveying records known as the *Corpus Agrimensorum Romanorum* that contains treatises dating as far back as the first century B.C.E. The principal Roman measuring instrument was the *groma*, used to lay out straight lines, right angles, and squares. The usual procedure was for the land surveyor to divide up the land, draw lots for the landholdings, and lead the settlers to their fields. He was also responsible for making a map (*forma*) and compiling a register. "Between **(p.104)** each pair of centuries was a *limes*, literally 'balk,' for which appropriate width was provided; in one direction each of these constituted a *kardo*, and at right angles to it was a *decumanus*."[22] A grid was organized and its sections named by reference to two main roads or axes, the *decumanus maximus* and the *kardo maximus*. This is how the grid appears in the *Corpus Agrimensorum* (Figures 6-2 and 6-3).

Erwin Walter Palm has pointed out that when it came to cadasters, colonies, and *castra*, Spain adopted features of the Roman system even before 1492. What was subsequently transferred to the New World followed in the footsteps of the Reconquista.

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However, there is a conspicuous difference between the shape of the Roman *castrum* and the planned colonial heterotopias: While the former is contained within a square with the four gates located at the ends of the *decumanus maximus* and the *kardo maximus*, the latter call for an infinite expansion. The gridiron that appears on the plans of Lima, Santiago de Léon de Caracas, or San Juan de la Frontera recalls the Greek cities designed by Hippodamus of Miletus. Hippodamus, a contemporary of Herodotus and graduate of the famous Milesian school, lived during the fifth century B.C.E. Aristotle records that he devised the gridiron plan for the port town of Piraeus. He is also credited with the checkerboard layout of Rhodes and of Miletus itself, destroyed by the Persians in 494 B.C.E. (see Figure 6-4). The Hippodamian grid consists of regular squares created by streets intersecting each other at right angles, evidently a concrete realization of that particular type of reason that characterized the Milesian school, which identified urban order with political order.[23] However, archaeologists have long known that the Hippodamian plan, too, had its predecessors, be they the Greek colonial settlements of the seventh and eighth century B.C.E. or the hypothetical Etruscan city plan, which may be the heritage of an Italianate tradition reaching far back into the ages preceding the **(p.106)**

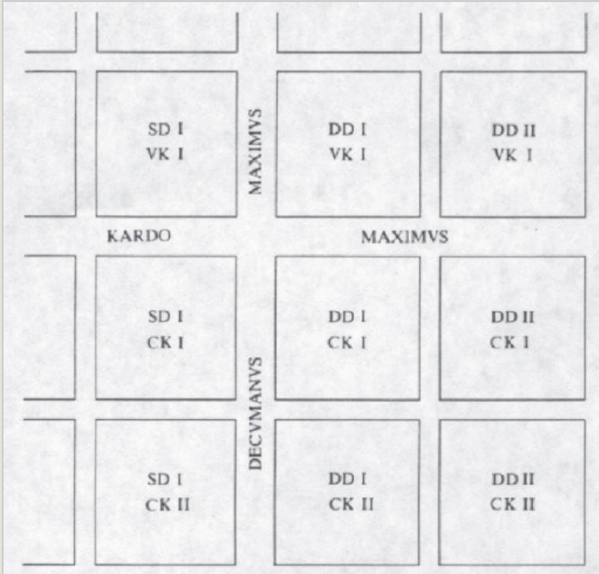

Figure 6-2. Centuriation. SD = sinistra decumani (left of the decumanus maximus), DD = dextra decumani (right of the decumanus maximus), VK = ultra kardinem (beyond the kardo maximus), CK = citra kardinem (this side of the kardo maximus). These abbreviations were engraved into the boundary stones that marked off the areas.

Reprinted from Harley and Woodward, eds., *Cartography in Prehistoric, Ancient, and Medieval Europe and the Mediterranean*, 213.

Figure 6-3. Illustration of uncultivated pasture land between two centuriated colonies. Miniature from the *Corpus Agrimensorum*. Biblioteca Apostolica Vaticana.

Reprinted from Centre de création industrielle and Centre Georges Pompidou, *Cartes et figures de la terre*, 403.

(p.107) Indo-European migration. But no matter what: According to Aristotle, it was Hippodamus “who invented the division of cities into precincts and who laid out the street-plan of the Piraeus.”[24] However, Aristotle saw Hippodamus less as a pioneer of a new kind of urbanism than as the inventor of a new way of segregating the population into three parts, one of skilled workers, one of farmers, “and [a] third to bear arms and secure defense.”[25] Damisch notes that the concept underlying the gridiron pattern devoid of a center is that of “nemesis.” In addition to the idea of vengeful fate, nemesis also refers to the notion of distributive law and of giving what is due, that is, to the correlated idea of an expansion in need of boundaries.[26]

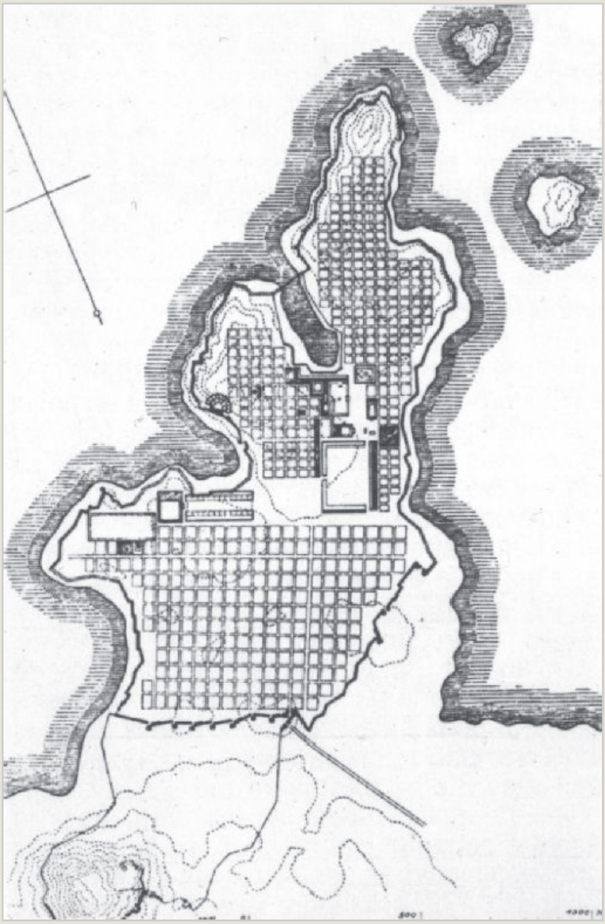

Figure 6-4. Plan of Miletus, attributed to Hippodamus. The city of Miletus was destroyed by the Persians in 494 B.C.E. and rebuilt after 479 or 466 B.C.E.

Published in Armin von Gerkan, *Griechische Städteanlagen* (1924); reprinted from *Cartes et figures de la terre*, 32.

In Miletus and Piraeus, the construction of surrounding walls, including the positioning of the gates, depended on geographical features and military considerations rather than on planning. This also applies to the foundation of sixteenth-century Middle and South American cities. Lima was seen as the most typical Latin American city (Figure 6-5). The Jesuit missionary and historian Bernabé Cobo (1582–1657) wrote of its founding in 1535:

> In order to found the city the governor first completed a drawing with streets and city blocks, whereon he noted who was to be assigned which plot by putting down their names; and doing this regardless of the number of inhabitants [*vecinos*] present at the time of foundation of the city (there were only 69) but with a view towards the size it promised to attain, a space large enough for 117 blocks was laid out. … Each had a front length of 450 feet, the settlement was to stretch 13 blocks in width and 9 in breadth, separated by streets, and ropes were used to assure that each street was 40 feet in breadth.[27]

Let us note two key points: First, the plan described by Cobo is at one and the same time plan, register, and cadaster. Second, the city was not planned and built on the basis of the actual number of settlers, or as a means of distributing property, but with a settlement fantasy in mind. This fantasy is enabled and sustained by the possibility of writing empty spaces, that is, the ability to literally reserve a space for the unknown. This, in turn, presupposes the separation of data and addresses. Persons (be they public or private) are turned into data that can be stored for subsequent retrieval by the correct addresses that logically and temporally precede them. The Latin American heterotopia is thus the first concrete realization of the storage model we know today as *working memory*. The 1562 charter of San Juan de la Frontera in the Cuyo region of Argentina reveals the future orientation alluded to by Cobo (Figure 6-6). The suggested continuation of the grid refers to its virtual boundlessness, and the multiplication of the squares is complemented by their internal divisibility.

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Figure 6-5. Map of Lima, Peru, 1687. Reprinted from Hardoy, *Cartografía urbana colonial de América Latina y el Caribe*, 146.

The planimetric settlement plan of Teutenango in Mexico from 1582 appears to have effectively fused scaled paper and *trazado a cordel* (Figure 6-7). The plots turn into an inscription surface, a sheet of scaled paper. The act of *Landnahme*, the taking of the land—in this colonial context, “land grab” would be a more appropriate translation—coincides with graphic operations on the paper surface. Political and diagrammatic space are one.

The *trazados* of the Latin American cities precisely conform to the double meaning of Spanish *padròn*: chart and register. Nothing demonstrates this more impressively than the city plan of Buenos Aires of 1583. It looks like a register, but it is a city plan—a city plan that is both register and cadaster (Figure 6-8). The *nomos* of the earth and the *nomos* of bureaucracy coincide. To live in one of the newly founded Latin American cities amounts to being registered in a grid in which, to quote Alberti, *omnia in locis suis disposita*—everything is assigned its own place. Santo Domingo, Mexico City, Lima, or Buenos Aires are at one and the same time topographic *loci* where people live and memorial *loci* in a storage medium. Cities are both physical space and technological memory.

The letters and memoranda penned by the Franciscan friar Gerónimo de Mendieta to the president of the Consejo de Indias shed light on the ontological status of the these urban data spaces. Mendieta’s proposals, aimed at improving **(p.109)** the economic and social conditions in the colonies, revolve around two governmental techniques: the introduction of registers and the foundation of new settlements (grid-shaped, naturally). The bill he drafted concerning the introduction of population registers in the Spanish colonies[28] contains a highly revealing ambiguous formulation: The official in charge of the registers is to “place every single one in his place.”[29] What did Mendieta have in mind with this phrase? Is the official to place “every single one in his place” in the register, or at their actual place of residence? The place in the register and the place of residence are made to overlap. How is one to distinguish the symbolic place from the real? This blurring of boundaries is no coincidence. It is, quite simply, **(p.110)** the situation—a situation determined by the culture-technical operationalization of deixis.

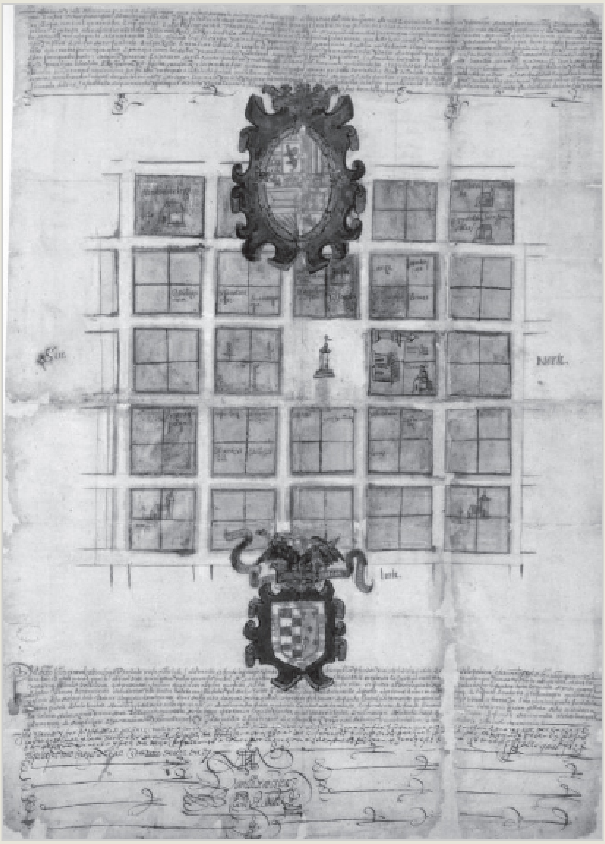

Figure 6-6. Foundation charter of the city of San Juan de la Frontera (Argentina), 1562.

Reprinted from Gonzáles García et al., *Archivo General de Indias*, 204.

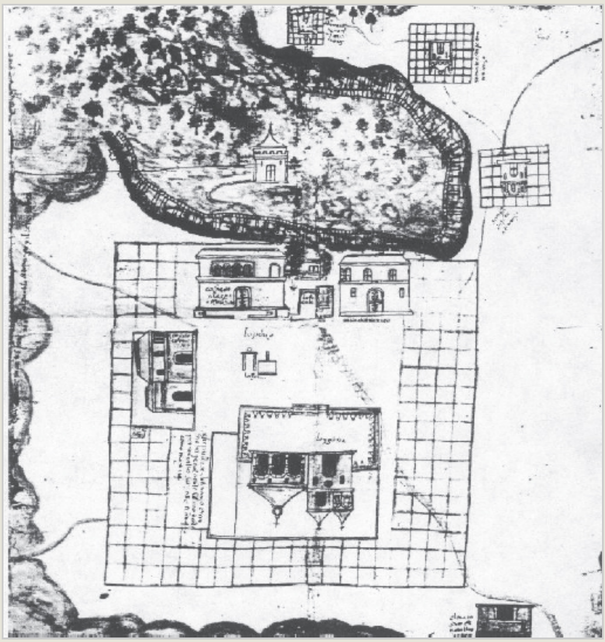

Figure 6-7. Map of Teutenango, Mexico, 1582.

Reprinted from Guidoni and Guidoni, *Storia dell'urbanistica: Il cinquecento*, 353.

This characteristic indistinguishability is also present in Mendieta's settlement projects. "[P]ara poner en asiento los muchos españoles que andan vagueando";[30] the Spanish are to be collected in *pueblos formados*, that is, in grid-shaped cities. *Poner en asiento* means both to settle and to register somebody. Thus Spanish colonialism was able to extract from the law guiding Alberti's constructions—namely, that the being of beings is constituted by their ability to be represented—a disciplinary and governmental dimension by applying the representational properties of Alberti's veil to the Hippodamic checkerboard. The result is, in Angel Rama's memorable phrase, the *lettered* **(p.111)** *city*.[31] Reality always already assumes the shape of writing; it becomes a repeated, quoted reality. By putting individuals into their place in the *padròn* (that is, in the symbolic), they are assigned definitive coordinates in the real. Those who once were lost are now in their place.

Figure 6-8. Plan of Buenos Aires, 1583.

Reprinted from Hardoy, *Cartografía urbana colonial*, 67.

The Speculative Grid (United States)

Two hundred years later: The U.S. Continental Congress passes the Land Ordinance of 1785. Claims to the territory west of the Alleghenies by "landed"' states such as Virginia in the south and Connecticut in the north as well as the ensuing dispute between "landed" and "landless" states compelled Congress to insist on cessions by the former and the creation of a public domain (the Northwest Territories). In the eyes of the landless states, their landed counterparts, which laid claim to the entire region north and west of the Ohio River as well as to the territory of the future state of Kentucky, threatened to dominate the confederation. More importantly, the United States was under pressure to pay off the debt incurred during the Revolutionary War. Deprived of taxing authority, Congress viewed the survey and partitioning of the Northwest Territories as a welcome opportunity to profit from land sales for the purpose of servicing the debt.[32] Unlike the sixteenth-century South American grid, then, its late **(p.112)** eighteenth-century North American counterpart was less a governmental technique than a scheme aimed at capitalizing on federal land. By means of the grid-shaped survey of the territories ceded by the landed states, the United States acquired territory, a public domain to be auctioned off in standardized plots at set prices. Although the rectangular survey prescribed by the Land Ordinance of 1785 only concerned territories between the Appalachians and the Mississippi, it became the model for the subsequent appropriation and colonization of the entire continent. Congress was confronted with a situation virtually unprecedented in history: It was empowered to "make the law governing the survey and distribution of a vast territory before it was occupied."[33]

Following a proposal put forward by Thomas Jefferson, Congress opted for a rectangular survey of straight lines and right angles, such as had been favored by the New En gland states in the earlier stage of colonization.[34] It basically consisted of projecting a township lattice of latitudes and longitudes onto the territories west of the Ohio. Initially the survey was to limit itself to a strip of land forty miles wide, located to the west of Pennsylvania and extending north from the Ohio into lands still held by Native Americans. Led by Thomas Hutchins, the surveyors divided the territory into townships of six square miles each "by lines running due north and south, and others crossing these at right angles, as near as may be."[35] Each range began at the Ohio with number 1 and was then numbered from south to north, while the seven ranges themselves were numbered from east to west (Figure 6-9).

The township plats were divided into "lots of one mile square or 640 acres,"[36] and were numbered from 1 to 36. Surveyors were instructed to keep a watchful eye on variations of the magnetic needle. As if transferring Simon Stevins's maritime navigational technique to the western outback,[37] they were to "run and note all lines by the true meridian, certifying, with every plat, what was the variation at the times of running the lines thereon noted."[38] In the late eighteenth century, this was—despite the impressive achievements of Mason and Dixon—a tall, if not impossible, order. Hutchins's surveyors' key tool was not a meridian but a circumferentor, "a simple compass fitted with sight vanes and mounted upon a ball and socket that fitted upon a 'Jacob's staff ' or a tripod."[39] The Ordinance further stipulated how the townships and the lots within were to be sold. Proceeding from top to bottom and east to west, townships sold entire alternated with townships sold by lots, resulting in the characteristic checkerboard.[40] The government was happy to accept gold, silver, loan office certificates, or certificates of liquidated debts of the United States as payment.[41] Within each township, government retained the four lots numbered 8, 11, 26, and 29 for future sales. Lot 16 was reserved for the public school.[42] Ideally, each lot corresponded to a warrant or promissory note. Grid patterns, colonization, **(p. 113)**

(p.114) and real estate speculation coincided. “Land so marked out could be quickly and easily located by settler, banker, loan shark, and, if need be, sheriff and truant officer.”[43] Once Congress entered into negotiations with speculators, the very soil of the American continent became the object of a transfer system that facilitated the circulation of real estate but did not always guarantee the optimal subdivision of the land for settlement purposes. Although the surveyors were instructed to maintain field notes on soil quality, water, and natural resources, purchasers could end up owning a swamp, a sandbank, or a piece of Native American territory. Financial and mental speculation became synonymous.[44] “The system not only made it simple to transfer land, which aided in the success of claim associations, and incidentally, that of speculators, it also contributed towards the attitude that land is a commodity.”[45] While the Spanish *padròn* with its governmental doubling of grid and register reterritorialized deracinated Europeans, Congress deterritorialized the land itself. In 1785 the smallest plot eligible for sale had to be 640 acres; in order to facilitate sales the minimum was reduced first to 320, then to 160, then to 80, and ultimately to 40 acres.

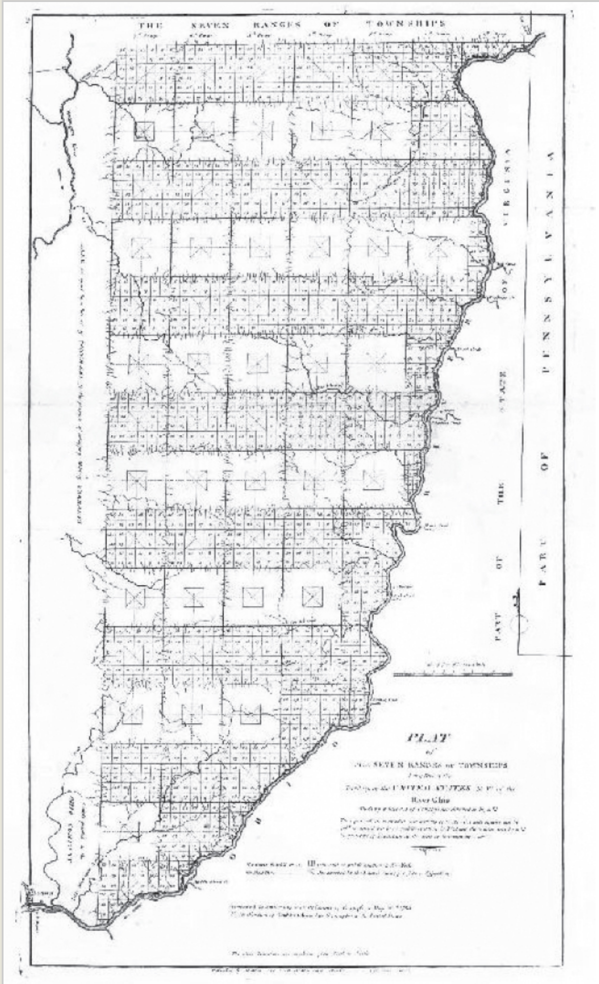

Figure 6-9. Mathew Carey after Thomas Hutchins, “Plat of the Seven Ranges of Townships being Part of the Territory of the United States N.W. of the River Ohio which by a late act of Congress are directed to be sold.”

Reprinted from *Carey’s General Atlas* (Philadelphia: Mathew Carey, 1800), plate 46.

The Seven Ranges survey effectively designed the entire West of the United States. The township grid is based on repeatability; it is projective, that is, it contains its own expansion up to the point of including the entire North American continent. As a cultural technique aimed at dominating space, the grid no longer appears as a potentially infinite growth of urban settlements; it is effectively cast across the land. This distinguishes the U.S. survey both from Roman centuriation and from Spanish urban planning. Settlements are no longer centers that may undergo centrifugal expansion, but cells in a homogeneous grid covering the entire territory. If Spanish colonialism was at bottom an urban affair, Jefferson's vision was essentially anti-urban, inspired by the ancient myth that cities are cesspools of vice while rural life nurtures the natural proliferation of virtues. The transformation of America into one nationwide suburb was preprogrammed. While the grids created by Roman centuriation and Spanish colonialism expanded outwards from their centers and grew toward each other in fairly haphazard fashion, the North American grid of parallels and meridians covers the entire territory. Hence the model for the latter was neither the Roman *castrum* nor the Hippodamic checkerboard but the Ptolemaic grid of latitudes and longitudes.[46] Faced with endless forests devoid of "churches, Towers, Houses, or peaked Mountains to be seen from afar,"[47] conventional European survey methods using theodolites and plane tables proved to be useless. Because the land appeared as undifferentiated as the ocean, early colonizers resorted to surveyor's chains as well as to tools used for maritime navigation, including compass, Jacob's staff, and the mesh formed by latitudes **(p.115)** and longitudes, which defines the planisphere.[48] Transferred from the ocean to dry land, the grid encompasses the entire territory rather than merely urban space; 69 percent of the territory of the forty-eight continental states is contiguously covered by the rectangular survey.[49] Once the idea of a grid-shaped division of the land into rectangular townships and lots had been approved, bureaucratic mechanisms were put in place to ensure that the straight lines were continued west of the Ohio. "Almost nothing stood in the way. The straight lines were spread over the prairies, the foothills, the mountains, over the swamps and deserts, and even over some of the shallow lakes."[50] Never before, Catherine Maumi notes, did humans have the opportunity to confront in such brutal and violent fashion that "entity known as space."[51]

After 1796 the rectangular survey was extended to cover the remainder of the old Northwest Territory, the Southwest Territory, and other areas acquired by the United States. The township became the base unit for several governmental purposes: taxation, census, electoral districts, and road construction. It is therefore characteristic that U.S. cartography is as much based on contiguous survey plans as it is on maps. The plans created an unsparing structure that prefigured the future appropriation of the wilderness. Nothing was left untouched: The rectangular system guaranteed that no shred of land remained masterless, as frequently had been the case in the Southern territories claimed by Virginia. Both plan and projection, the uniform system of rectangular townships and sections assigned to everything—wilderness, plains, forest, or swamp—its own place. Nothing was allowed to fall off the grid.

The Three-Dimensional Grid

If we add a third orthogonal axis to the geodetic grid, it unfolds into a three-dimensional structure. Architecture, then, can be understood as an additional dimension of imaging, topographic, cartographic, and governmental grids. At least this is exactly how the Bauhaus architect and Gropius disciple Ernst Neufert, author of the hugely influential *Bauordnungslehre* (published in English as *Architects' Data*), saw architecture. First published in 1943 with a preface by Albert Speer, Nazi Minister of Armaments and War Production and Hitler's chief architect, it outlined a method for the complete standardization and totalization of the grid on all scales: The lattice not only connects all the buildings at a given site and determines their position and proportion, just like the grid of latitudes and longitudes, it also covers the entire globe. Neufert's grid turns navigation in smooth space into the ubiquitous paradigm of being-in-one's-place. "As on the ocean the squared grid (allows) us … to immediately and unequivocally determine the location of the buildings and any other installation. When **(p.116)** built according to norm, the buildings will inevitably fit into this grid."[52] Thus Neufert's scalable planning and localizing grid anticipates the link-up of matrix screen and global coordinate system realized by Google Earth. It potentially enables on a global scale the exact location of individual buildings. On the scale of the latter, in turn, it serves to define the size and position of each object within the house, from walls, doors, and windows to stairs and furniture.[53]

If Neufert's norms were to determine our entire industrial production, then any new building would fit as seamlessly into any new settlement as any door into any door frame or any piano into any drawing room. Indeed, Neufert's own ideas fit with equal ease into the totalizing, frequently fantasmatic standardization projects that emerged in the early twentieth century. Think, for instance, of the "world format" dreamed up by Wilhelm Ostwald and Karl Bührer,[54] in which a standardized index card in a standardized filing box in a standardized cabinet in a standardized office building amounts to nothing more than the nth subdivision of a global standardization system (Figures 6-10 and 6-11).

Unfolded into three dimensions and repeated in vertical and horizontal directions, the grid does more than define the space of architecture—it turns into architecture. At the outset of the twentieth century, new materials and

(p.117)

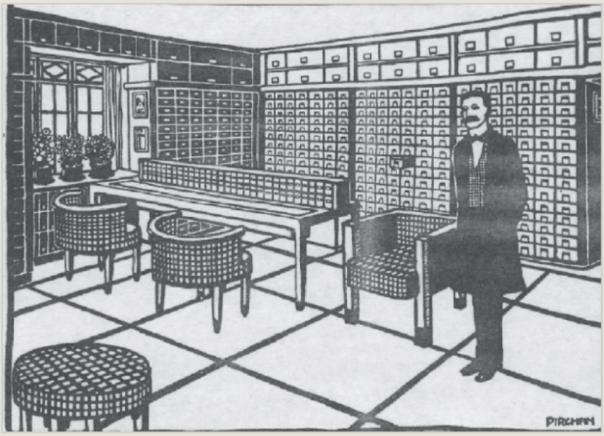

Figure 6-10. "World Format Scholar's Library."

Reprinted from Karl Bührer, *Raumnot und Weltformat*, illustrated by Emil Pirchan (Munich: Die Brücke, 1912), 24.

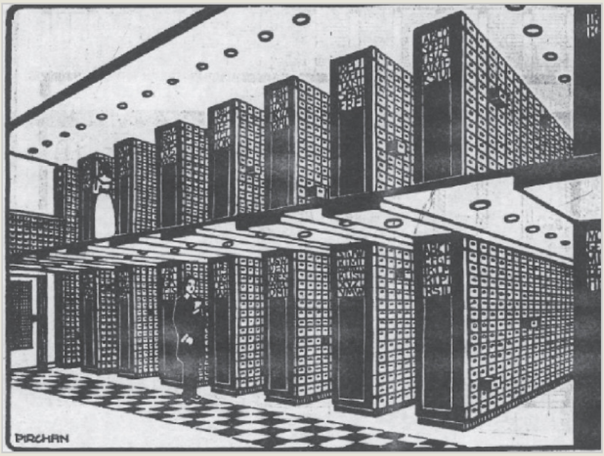

Figure 6-11. "World Format Large Library." From Bührer, *Raumnot und Weltformat*, 30.

technologies including concrete and steel frames made it possible to construct a building from the inside out. For Mies van der Rohe only a skyscraper under construction was a real skyscraper, for only so long as its sides had not been closed and covered was the steel skeleton able to make the constructive idea transparent.[55] Glass facades were therefore for Mies no more than a compromise with the inevitable. One possible construction method is to start with the smallest spatial element—the cell. Another is to focus on the steel structure and the free layout. (Le Corbusier programmatically referred to this model as a *plan libre*.) In both cases the facade is no longer part of the load-bearing structure and is thus free for almost any kind of design. "To build a uniform world from the smallest spatial cell," Walter Prigge notes, "is the rational architectural utopia of the mid-1920s."[56] Le Corbusier, the hero of modern architecture, was one of the pioneers of an architectural dispositive in which cells (*cellules*) function as the smallest and most common element of construction. Historically, this dispositive is rooted both in the disciplinary society and in biology. On the one hand, it arises from the extensive tradition of disciplinary architecture that includes both the monastic and the prison cell. The emphasis on the cell as the smallest possible human living space reveals that modern architecture's obsession with spatial **(p.118)** standardization is a generalization of the basic module of the disciplinary society. On the other hand, Le Corbusier is drawing on the discourse of cellular biology that identifies the cell as the basic building block of life. However, Le Corbusier's real model for cellular construction was neither plant nor prison but the machine. It is no coincidence that he developed his ideas about human-scale cells and the cell-based "dwelling machine" on board an ocean liner. Its cabins struck Le Corbusier as the optimal realization of the cellular principle under the spatial confinements of sea travel. The dimensions of the human-scale cellular dwelling, 15.75 square meters, correspond exactly to the size of the luxury quarters on his 1929 voyage from Bordeaux to Buenos Aires.

The cell had already in the early 1920s been a central component of Le Corbusier's architectural theory. Now, in 1929, as part of a series of lectures in Argentina and Brazil, he expanded the cellular concept: It is no longer a matter of designing single-family units but of planning entire cities with three million inhabitants. Here, on the continent of colonial, potentially infinite grid-shaped settlement topography, Le Corbusier proclaimed an architectural vision based on the replication of standardized, industrially prefabricated, and easily transportable dwelling cells of modular design:

> A unit of human scale: 15 square meters. … [T]he dwelling, the office, the workshop, the factory … will use new forms of standardization, of industrialization, of efficiency. … We shall get to the house assembled from standard components, prepared in factories, made perfect by industrialization, like an automobile body, and put up on site by *assembly workers.* … These methods of industrialization by standardization lead us naturally to the coming skyscrapers: its form is determined by the superposition of cells at human scale. … Let us multiply the standard elements of a dwelling. … Dwellings should not be made in meters, *but in kilometers*.[57]

Le Corbusier had the writer and aviator Antoine de Saint-Exupéry fly him across the wide plains of Argentina, Brazil, and Uruguay. The sight of the checkerboard topography of colonial cities from an altitude of 1,200 meters convinced him that "[t]his American country is dimensioned for the plane."[58] Back on solid ground, Le Corbusier drafted plans for a new Montevideo, Uruguay and a new São Paulo, Brazil (Figure 6-12). The airplane has become a design tool: From its aerial perspective the South American city of the future appears to be part of the cartographic grid. Suggesting the global grid, the future São Paulo will consist of two giant extended steel skeleton buildings that cross each other at right angles. Highways lead across the buildings; additional skyscrapers surround the intersection. Superimposed on the gridlike topography of Spanish colonial settlements, the grid of latitudes and longitudes reveals its projective nature.

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Rationalization by standardization is not only apparent in temporary constructions such as mass-produced barracks and containers;[59] it is also present in the visions of monumental residential constructions that can be found in Neufert's *Architects' Data.* As on an assembly line, a railbound slipform construction machine installs one cell block after the other. The three-dimensional grid continues the limitlessness of the two-dimensional topographical grid (Figure 6-13).

From this interconnectivity of grids, Le Corbusier and Neufert derived the vision of a future which in many respects is our present. The fusion of matrix grid and GPS has ensured the global presence of the operationalized deixis first conceived of in connection with the grid- and register-shaped settlements of South America. Indeed, what better way to describe some of the basic aspects of our media culture than to point to the mutual translatability of cartographic grid, topographic grid, planning grid, and imaging grid? Linked with the convertibility of these diverse grids and with corresponding scaling techniques, grids—a formidable cultural technique—have become the basis of a mediatization of space from which hardly anything can escape.

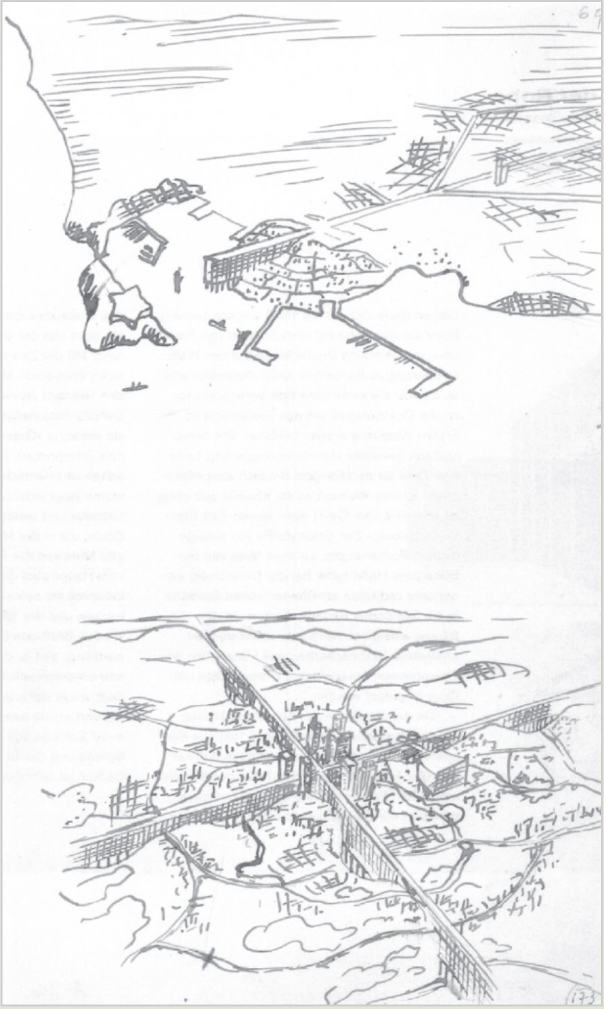

Figure 6-12. Le Corbusier, projects for Montevideo and São Paulo, 1929.

Ink on paper. Museum of Modern Art. Emilio Ambasz Fund, © 2014 Artists Rights Society (ARS), New York / ADAGP, Paris / FLC.

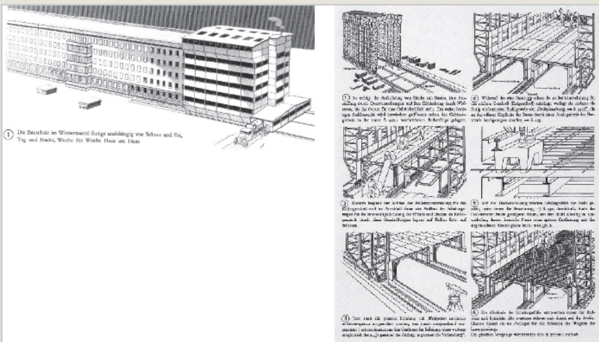

Figure 6-13. Ernst Neufert's railbound slipform house construction machine.

Reprinted from Neufert, *Bauordnungslehre* (1943).

Notes:

(1.) Xenophon, *“Memorabilia” and “Oeconomicus*,” trans. E. C. Marchant (Cambridge: Harvard University Press, 1938), 439.

(2.) Ibid.

(3.) See Gilles Deleuze, *Foucault*, trans. Sean Hand (Minneapolis: University of Minnesota Press, 1988), 34.

(4.) Michel Foucault, “Why Study Power: The Question of the Subject,” in *Beyond Structuralism and Hermeneutics*, ed. Hubert L. Dreyfus and Paul Rabinow (Chicago: University of Chicago Press, 1982), 208.

(5.) See Rosalind Krauss, “Grids,” *October* 9 (1979), 50–64.

(6.) Leon Battista Alberti, *On Painting: A New Translation and Critical Edition*, trans. Rocco Sinisgalli (Cambridge: Cambridge University Press, 2011), 51.

(7.) See Karin Leonhard and Robert Felfe, *Lochmuster und Linienspiel: Überlegungen zur Druckgrafik des 17. Jahrhunderts* (Freiburg im Breisgau and Berlin: Rombach, 2006), 29–36.

(8.) See Birgit Schneider, *Textiles Prozessieren: Eine Mediengeschichte der Lochkartenweberei* (Zürich and Berlin: Diaphanes, 2007).

(9.) Alberti, *On Painting*, 23.

(10.) Ibid., 51. Opinions differ as to who invented the threaded veil. Some art historians favor Filippo Brunelleschi, to whom Alberti dedicated the Italian version of his treatise *De pictura* (*Della Pittura*). Brunelleschi is said to have used a *velo* to draft the panel of the Florence Baptistery with which he proved the “truth” of central perspective; see Volker Hoffmann, “Filippo Brunelleschi: Kuppelbau und Perspektive,” in *Saggi in onore di Renato Bonelli: Quaderni dell’istituto di storia dell’architettura*, ed. Corrado Bozzoni, Giovanni Carbonara, and Gabriela Villetti (Rome: Multigrafica Editrice, 1992), 323. It is known that Brunelleschi used squared paper for the topographic registration of Rome’s ancient ruins. According to his biographer Antonio Manetti, Brunelleschi “made measured drawings of Roman buildings, using his understanding of standard surveying techniques. … The results were recorded ‘on off cuts of parchment … by means of squared divisions of the sheets, with arabic numerals and characters which Filippo alone understood’”; Martin Kemp, *The Science of Art: Optical Themes in Western Art from Brunelleschi to Seurat* (New Haven: Yale University Press, 1990), 11–12. The astronomer Paolo dal Pozzo Toscanelli, an alleged friend of Brunelleschi, used squared paper featuring Indian numerals to note line and column to record celestial observations. Antonio di Pietro Averlino, known as Filarete, describes in great detail in *Trattato di architettura* (app. 1461–1464) the usefulness of checkered paper for architectural design, especially with regard to the scalability of to-scale plans that enable readers to have a sense of the dimensions of fictitious buildings; see Filarete, *Tractat über die Baukunst nebst seinen Büchern von der Zeichenkunst und den Bauten der Medici*, ed. Wolfgang von Oettingen (Vienna, 1890; reprinted, Hildesheim and New York: Olms, 1974), 86.

(11.) Alberti, *On Painting*, 49.

(12.) Long before Alberti, such painters as Giotto wrestled with the problem of where to place the nimbus in paintings that conjure up the illusion of depth. Where, for instance, is the nimbus of angels depicted in profile? And where is it in rear views? The Scrovegni Chapel in Padua features halos drawn in perspectival foreshortening. For further details see Wolfgang Braunfeld, *Nimbus und Goldgrund: Wege zur Kunstgeschichte, 1949–1975* (Mittenwald: Mäander Kunstverlag, 1979), 12–15.

(13.) Hubert Damisch, *The Origin of Perspective*, trans. John Goodmann (Cambridge: MIT Press, 2000), xxi.

(14.) See Brian Rotman, *Signifying Nothing: The Semiotics of Zero* (Stanford: Stanford University Press, 1993).

(15.) See Oswald Ashton Wentworth Dilke, “The Culmination of Greek Cartography in Ptolemy,” in *Cartography in Prehistoric, Ancient and Medieval Europe and the Mediterranean*, ed. John B. Harley and David Woodward (Chicago: University of Chicago Press, 1987), 177–200.

(16.) See William Boelhower, “Inventing America: A Model of Cartographic Semiosis,” *Word and Image: A Journal of Verbal/Visual Enquiry* 4, no. 2 (1988): 482–83.

(17.) See Joachim Krausse, “Information at a Glance: On the History of the Diagram,” *OASE: Tijdschrift voor architectuur* 48 (1998): 3–30.

(18.) Martin Heidegger, “The Age of the World Picture,” in *The Question Concerning Technology and Other Essays*, trans. William Lovitt (New York: Harper and Row, 1977), 115–54.

(19.) Hubert Damisch, “La grille comme volonté et comme représentation,” in Centre de création industrielle and Centre Georges Pompidou, *Cartes et figures de la Terre*, exhibition catalogue (Paris: Centre de création industrielle and Centre Georges Pompidou, 1980), 30.

(20.) See James M. Houston, “The Foundation of Colonial Towns in Hispanic America,” in *Urbanization and Its Problems: Essays in Honour of E. W. Gilbert*, ed. Robert P. Beckinsale and James M. Houston (Oxford: Blackwell, 1968), 352–90.

(21.) The discussion that follows draws on Oswald Ashton Wentworth Dilke, “Roman Large-Scale Mapping in the Early Empire,” in Harley and Woodward, eds., *Cartography in Prehistoric, Ancient and Medieval Europe and the Mediterranean*, 213–14, 212–33., 216–17, 221–24.

(22.) Dilke, “Roman Large-Scale Mapping,” 215.

(23.) Damisch, “La grille comme volonté et comme représentation,” 32.

(24.) Aristotle, *Politics*, trans. J. A. Sinclair (Harmondsworth: Penguin, 1992), 1267b23 (p. 134).

(25.) Ibid.

(26.) Damisch, “La grille comme volonté et comme représentation,” 32.

(27.) Bernabé Cobo, *Historia de la fundación de Lima* (1639). Quoted in Bertram Lee, ed., *Libros de Cabildos de Lima* (Lima: Torres Aguirre, 1935), 2:475.

(28.) See Bernhard Siegert, *Passagiere und Papiere: Schreibakte auf der Schwelle zwischen Spanien und Amerika* (Munich: Wilhelm Fink Verlag, 2006), 130–41.

(29.) Joaquin García Icazbalceta, ed., “Carta del Padre Fray Jerónimo de Mendieta al Ilustre Señor Licenciado Joan de Ovando, del Consejo de S.M. en la Santa y General Inquisición y Visitador e su Real Consejo de Indias,” in *Nueva Colección de documentos para la historia de México* (Mexico City: Editorial Salvador Chá vez Hayhoe, 1886–92), 123.

(30.) “[P]ara recoger in pueblos formados y poner en asiento los muchos espanoles que andan vagueando por aquella tierra, no on poco perjuicio del pro común della”; quoted in Norman F. Martin, *Los vagabundos en la Nueva Espana, siglo XVI* (Mexico City: Editorial Jus, 1957), 60.

(31.) See Angel Rama, *The Lettered City*, trans. John Charles Chasteen (Durham, N.C.: Duke University Press, 1996).

(32.) See George W. Geib, "The Land Ordinance of 1785: A Bicentennial Review," *Indiana Magazine of History*, 81, no. 1 (1985), 1–13.

(33.) Vernon Carstensen, "Patterns on the American Land," *Publius* 18, no. 4 (1988), 33.

(34.) Beginning in the early eighteenth century, land development in Connecticut, Massachusetts, and Maine instituted the township as the central vehicle for expansion. Precise guidelines were established, from the number of families per township and the size of plots to the percentage of land allocated to the local school and the number of acres to be covered with green lawn. See Catherine Maumi, *Thomas Jefferson et le projet du Nouveau Monde* (Paris: Éditions de la Villette, 2007), 84, and Geib, "The Land Ordinance of 1785," 6. Matters were handled differently in the South: "Under the southern system, land was purchased under warrants that merely specified acres and general locations. Survey, if any, usually followed the occupation of an attractive location of the appropriate size" (ibid.).

(35.) United States Continental Congress, "An Ordinance for Ascertaining the Mode of Disposing of Lands in the Western Territory (20 May 1785)," in *Journals of the Continental Congress, 1774–1789*, vol. 28 (1785), ed. John C. Fitzpatrick (Washington: U.S. Government Printing Office, 1933), 375.

(36.) Ibid., 376.

(37.) See Simon Stevin, *The Haven-Finding Art, or, The Way to Find any Hauen or Place at Sea by the Latitude and Variation* (London: G.B.R.N. and R.B., 1599).

(38.) U.S. Continental Congress, "An Ordinance," 376–77.

(39.) Geib, "The Land Ordinance of 1785," 12.

(40.) See Hildegard Binder Johnson, *Order upon the Land: The U.S. Rectangular Land Survey and the Upper Mississippi Country* (New York: Oxford University Press, 1976), 44 and 143.

(41.) U.S. Continental Congress, "An Ordinance," 376–77.

(42.) Johnson, *Order upon the Land*, 44.

(43.) Carstensen, "Patterns on the American Land," 31. See also Stefan Kaufmann, *Soziologie der Landschaft* (Wiesbaden: VS Verlag für Sozialwissenschaften, 2005), 172.

(44.) On the roots of this merging of the various meanings of *speculation* during the Italian Renaissance, see chapter 7.

(45.) Johnson, *Order upon the Land*, 219.

(46.) See Kaufmann, *Soziologie der Landschaft*, 185.

(47.) Lewis Evans, "Notes Accompanying the General Map of the Middle British Colonies in America," 1755, quoted in *The Shape of the World*, ed. Simon Berthon and Andrew Robinson (London: George Philip, 1991), 152.

(48.) Maumi, *Thomas Jefferson*, 43. Surveyors' chains were an additional tool for measuring the east-west distances. For a detailed analysis of the transfer of the methods of maritime cartography onto the North American territory, as well as of the imagination of the American landscape as an ocean, see Kaufmann, *Soziologie der Landschaft*, 185–207 and 210–13.

(49.) See Johnson, *Order upon the Land*, preface, n.p.

(50.) Carstensen, "Patterns on the American Land," 31.

(51.) Maumi, *Thomas Jefferson*, 12. On the North American rectangular survey see also William D. Pattison, *Beginnings of the American Rectangular Land Survey Systems, 1784–1800* (New York: Arno Press, 1979), and Norman J. Thrower, *Original Survey and Land Subdivision: A Comparative Study of the Form and Effect of Contrasting Cadastral Surveys* (Chicago: Rand McNally, 1966).

(52.) Ernst Neufert, *Bauordnungslehre: Handbuch für rationelles Bauen nach geregeltem Mass* (Frankfurt/M. and Berlin: Ullstein, 1961), 95.

(53.) See Alexander Klose, "Vom Raster zur Zelle—die Containerisierung der modernen Architektur," lecture delivered at Bauhaus University, Weimar, January 17, 2006; in English, "From Grid to Box: The Containerization of Modern Architecture," lecture delivered at Goethe Institute, Prague, October 7, 2005, at the workshop "City-Media-Space." Both versions available at http://www.containerwelt.info./ordner_eigene_texte.html.

(54.) In 1911 Karl Bührer and Adolf Saager cofounded Die Brücke: Internationales Institut zur Organisierung der geistigen Arbeit (The Bridge: International Institute for the Organization of Intellectual Work), with the goal of solving the problems resulting from the internationalization of the sciences by creating global standards.

(55.) See Ludwig Mies van der Rohe, "Hochhausprojekt für Bahnhof Friedrichstrasse in Berlin (1922)," in *Frühlicht 1920–1922: Eine Folge für die Verwirklichung des neuen Baugedankens*, ed. Bruno Taut (Berlin, Frankfurt/M., and Vienna: Ullstein, 1963), 213.

(56.) Walter Prigge, "Typologie und Norm: Zum modernen Traum der industriellen Fertigung von Wohnungen," in *Constructing Utopia: Konstruktionen künstlicher Welten*, ed. Annett Zinsmeister (Berlin and Zürich: Diaphanes, 2005), 74–75.

(57.) Le Corbusier, "A Dwelling at Human Scale," in *Precisions on the Present State of Architecture and City Planning*, trans. Edith Schreiber Aujame (Cambridge: MIT Press, 1991), 90, 91, 95, 97–98, and 100 (emphases in the original). *Translator's note*: As in the quote above, Le Corbusier's *cellule* is sometimes translated into English as "dwelling" or "unit of dwelling."

(58.) Le Corbusier, "American Prologue," in *Precisions on the Present State of Architecture and City Planning*, 3.

(59.) For barracks, see Axel Dossmann, Jan Wenzel, and Kai Wenzel, *Architektur auf Zeit: Baracken, Pavillons, Container* (Berlin: B-Books, 2006); for containers, see Alexander Klose, *Das Container-Prinzip: Wie eine Box unser Denken verändert* (Hamburg: Mare, 2009).