

# ‘De Huysbou’

A reconstruction of an unfinished treatise on architecture, town planning and civil engineering by Simon Stevin



Charles van den Heuvel

‘De Huysbou’

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A reconstruction of an unfinished treatise on  
architecture, town planning and civil engineering  
by Simon Stevin

Charles van den Heuvel

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For Janet and Louise



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# Acknowledgements

Professor Ed Taverne of Rijksuniversiteit Groningen first explored the possibility of reconstructing Simon Stevin's *Huysbou* in 1984. In his article, 'Architecturae Domesticae Stevini Synopsis', he expressed the hope that his efforts would encourage further research into the contents of familiar and as yet unknown fragments of Stevin's treatise on town planning and architecture with the eventual purpose of producing an integral publication. In 1992 Netherlands Organisation for Scientific Research (NWO) made a three-year grant available for an annotated publication of Stevin's *Huysbou* texts. I am grateful to Professor Taverne for having entrusted me with the completion of the reconstruction and hope that, despite our differences in approach and interpretation, my endeavours nevertheless correspond to some extent to his original vision.

Professor Klaas van Berkel (University of Groningen) supplied invaluable comments on scientific-historical aspects of the discussion of Stevin's treatment of architecture, for which I am especially grateful. Dr. H. Janse offered advice on the compilation of the glossary. I would also like to thank Professor Koen Ottenheim (University Utrecht) and Professor Krista De Jonge (Catholic University of Louvain) for the interest they have shown in my research. Always very enthusiastic were the comments of Professor Jozef T. Devreese (University of Antwerp, Technical University Eindhoven), born in Stevin's place of birth, Bruges.

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S. Herman and J. Rudge provided the translations. I am most grateful for Sam Herman's efforts in turning the draft manuscript into a readable book.

Finally, I would like to thank my wife, Janet Armstrong, for her contribution to the preparation and layout of the manuscript which was originally presented to NWO in November 1995. Since the completion of the manuscript many valuable publications came out. It was not always possible anymore to incorporate the results in this book, let alone my own new insights, since the text was already translated many years ago before a lengthy process of editing started. For these publications I have to refer to the bibliography which I have tried to update as much as possible. Concerning my hypothesis for the reconstruction of the Huysbou, I would like to paraphrase Stevin's remarks when presenting his design for a house: 'I first want to say that it is not my intention that this layout will please everyone, or even the majority, or a few, or that I myself will always regard it as the best; after long discussion and enquiry however it is the most convenient that I have up till now been able to conceive of'.

Maastricht, 2004

# Foreword

Since the unrivalled biography by Eduard Dijksterhuis of 1943 and the various contributions in the *Principal Works of Simon Stevin*, published under the auspices of the Royal Netherlands Academy of Arts and Sciences (KNAW), few new original sources connected with this famous mathematical scholar and his work have come to light. An interesting exception is a previously unknown publication on bookkeeping from 1581, recently attributed to Stevin, as well as the discovery of two cashbooks drawn up in the system introduced by Stevin for the administration of the court and the princely domains of his patron, the stadholder Maurice of Nassau. The latest discovery was a small publication and manuscript of 1600 by J. Paedts Jacobszoon of Stevin's original instruction for the Duytsche Mathematique, a training school for engineers/land surveyors at Leiden. The discussion of the present reconstruction of Stevin's *Huysbou* is therefore not intended as a monograph on the author; no explanation of his innovative method of decimal notation is contained here nor of his famous hydrostatic paradox. This volume deals with Stevin's unfinished, and until now only partly revealed architectural treatise.

The discussion of Stevin's *Huysbou* opens by exploring the origins of the ideas contained in the work. The four subsequent chapters examine Stevin's notions of symmetry and order in architecture, his views on building methods, the role of water and the use of visual presentations of architecture. The sixth and seventh chapter of the commentary surveys Stevin's contribution to architectural theory and the reputation enjoyed by *Huysbou* in the Low Countries and in the broader European context.

The second section of the book contains Stevin's work on architecture and town planning. This is not a critical text in the ordinary sense. Stevin's *Huysbou* was never actually published as such and the precise intentions of the author are no longer known. Nonetheless, an attempt has been made here, based on Stevin's own notes regarding the composition of the architectural treatise and the often contradictory lists of contents drawn up by others after his death, to recreate the envisaged *Huysbou* as accurately as possible. This reconstruction is preceded by a discussion in three chapters of the work's genesis, the first

attempts to uncover the original form of the opus and an explanation of the framework upon which this hypothetical reconstruction is based.

The actual reconstruction is based on the compilation of extracts from Stevin's architectural commentaries recorded by his son and various contemporaries. Naturally, the present author is aware that this attempt poises precariously on the margins of historical fiction. The reconstruction is more than just an incomplete treatise; it is a new work in which the gaps have been filled with extracts and comments found elsewhere in Stevin's oeuvre. This approach has been taken because the generally accepted version of Stevin's architectural texts, that published by Hendrick Stevin in *Materiae Politicae* in 1649, purposely deviates from the original structure, presenting *Huysbou* in a distorted format. In unpublished extracts from the original work, Isaac Beeckman and Constantijn Huygens revealed entirely different aspects of the book, highlighting parts otherwise ignored. These texts have been brought together here for the first time. In order to ensure that the context of the parts from which the reconstructed *Huysbou* has been composed remains transparent for the reader, the extracts and comments have been incorporated in their entirety in appendices. These include the excerpts recorded by Isaac Beeckman and Hendrick Stevin that have not previously appeared in print.

The presentation of these various extracts as separate items sheds light on the substance of Stevin's architectural treatise, but not on the intended form of his *Huysbou*. The presentation of these fragments is therefore accompanied by an attempt to merge these into a whole. After all, it is only by reconstructing the treatise in its complete form that the significance of the various parts can be properly assessed. 'It is,' as Stevin noted, remarking on the formulation of scientific propositions, 'like a wax model, with a head, arms and legs, which if melted are no longer limbs, but part of the same material'.

# Stevin's writings on architecture



# 1. Stevin and the origins of his *Huysbou*

*So that everyone might come to understand these great sciences as they were in the Age of Sages<sup>1</sup>*

Originally from the Flemish city of Bruges, Simon Stevin (1548-1620) was one of the leading scholars of his day. As a scientist and engineer, he carved a career for himself in the breakaway Dutch Republic of the Northern Low Countries, developing theoretical innovations in mathematics and physics as well as practical innovations in civil engineering and military technology. Somewhat less well known is the project that Stevin worked on during the last twenty years of his life, a treatise on architecture and town planning. The earliest mention of Simon Stevin's *Huysbou* – or more accurately his two 'Huysbouwen' – occurs in the first volume of his work on mathematics and other natural sciences, *Wisconstighe Ghedachtenissen* ('Mathematical Memoirs'), published in 1605.<sup>2</sup> The preface to a treatment of perspective, 'Van de Deursichtige', contains a reference to a treatise on architecture. Here Stevin stated that he had written a 'Huysbau' some years previously for private use, in which he addressed this subject.<sup>3</sup> In his introduction to the chapters of 'Eertclootschrift', in a discourse on geography in 'Vant Wereltschrift' ('Cosmography'), Stevin noted that he had carried out an exhaustive study on the erosion of building works, subsidence, silting of canals and problems relating to pile driving and had recorded his observations in an architectural treatise.<sup>4</sup> After Maurice of Nassau, stadholder and commander of the Dutch army, had read and confirmed the importance of this material, Stevin had decided to publish the work. Finally, a third mention occurs in the list of contents of the fifth chapter

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<sup>1</sup> S. Stevin, *Wisconstighe Ghedachtenissen*, (Leiden: 1605 and 1608), 'I Bouck des Eertclootschrifts', p. 17: '[...] om allencx weerom te gheraken an sulcke groote wetenschappen alsser in de Wysentijnt geweest sijn.'

<sup>2</sup> For a fuller discussion of the history of *Huysbou* see chapter 8.

<sup>3</sup> S. Stevin, *Wisconstighe Ghedachtenissen*, 'Derde Stuck der Wisconstighe Ghedachtenissen. Van de Deursichtige', in *The Principal Works of Simon Stevin*, vol. 11 b, (Amsterdam 1958), p. 800: 'Nu alsoo ick over eenighe jaren, voor my self beschreven had een Huysbau'.

<sup>4</sup> S. Stevin, *Wisconstighe Ghedachtenissen*, 'Tweede Bouck des Eertclootschrift Vant Stofroersel des Eertcloots', 'Oirsaeck der beschrijving deses 2 boucx', p.51



of *Wisconstighe Ghedachtenissen*, ‘Vande Ghemengde Stoffen’ (Miscellanea). Further on, however, Stevin explained in a note that he had not been able to finish several sections of this chapter, including his *Huysbou*, in time for the printer and planned, therefore, to publish these at a later stage.<sup>5</sup>

But it was not to be. By the time Stevin died, only a few fragments had appeared in other publications.<sup>6</sup> Fortunately, several scholars made transcripts after his death and even published some of the material, thus preserving crucial information about Stevin’s *Huysbou*.

In 1624, the scholar Isaac Beeckman made several journeys to Hazerswoude, to visit Stevin’s widow, who had by then remarried. There he ploughed through piles of manuscripts, compiling a meticulous inventory of the surviving documents and drawing up lists of contents of individual texts, including *Huysbou*. Beeckman copied passages from the latter, recording these along with the lists of contents in his ‘Journael’, a collection of daily observations of experiments and commentaries on the works of contemporary scholars.<sup>7</sup> While a student in 1905, Cornelis de Waard discovered Beeckman’s ‘Journael’ at the provincial library in Middelburg and subsequently published it in several volumes between 1939 and 1953.<sup>8</sup> Unfortunately, he did not include all the transcripts of Stevin’s works in full, but only those passages which he assumed had not been previously published. This is all the more regrettable since the manuscript was badly damaged during the Second World War, soaked by water when a fire at the library was extinguished. The ‘Journael’, and with it Beeckman’s unpublished

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<sup>5</sup> S. Stevin, *Wisconstighe Ghedachtenissen*, ‘Vijfde Stuck der Wisconstighe Ghedachtenissen’, p. 107: ‘Van Etteliche ghebrenkende stoffen, die inde voorgaende Cortbegrippen wel ghestelt wesende, nochtans daer na onbeschreven sijn ghebleven [...] Ten sesten\* den Huysbou, wesende het 4<sup>e</sup> deel des vijfde stucx van de Ghemengde stoffen.[...] D’oorsaek waerom die niet ghestelt en sijn na t’inhoudt der voorschreven Cortbegrippen, is datse niet volcommelick genough gereet en waren, doen den Drucker niet langer by hem en begheerde te bewaren datter een tijt lanck tot sijn achterdeel ghedruckt hadd egheleghen: Sulcx dat mijn voornemen nu is de bovenscreven rest ter gheleghnder tijt te laten uytgaen’.

<sup>6</sup> Stevin published a few fragments intended for *Huysbou* during his lifetime in *Nieuwe Maniere van Stercbeou door Splishuysen*, [Rotterdam 1617], in *The Principal Works of Simon Stevin*, vol.v, (Amsterdam 1966) pp. 83-199.

<sup>7</sup> I. Beeckman, *Loci communes font formae omnium rerum agendorum virtutum aliorumque communium, thematum, communes, quae fece in usum variasque rerum humanarium acuterarum causas incidere possunt [...]* (1604), Middelburg, Zeeuwse Bibliotheek, HS. 6471. The term ‘Journael’ is borrowed from Cornelis de Waard. Although he did not justify his use of the term it is nevertheless apt and has often been employed since. To differentiate, the term ‘Journal’ is used here when referring to De Waard’s publication and ‘Journael’ in specific references to Beeckman’s manuscript. Cf. K. van Berkel, *Isaac Beeckman (1588-1673) en de mechanisering van het wereldbeeld*, (Amsterdam 1983), p.6.

<sup>8</sup> I. Beeckman, *Journal tenu par Isaac Beeckman de 1604 B 1634 publié de C. de Waard*, (The Hague 1939-1953). For Isaac Beeckman, see also Van Berkel, *Isaac Beeckman*.

transcripts of Stevin's work, were rendered virtually illegible. Simon Stevin's son, Hendrick, also drew up lists of contents and made transcripts of his father's manuscripts. One of these, entitled 'Eenighe stucken der Crychconst, beschreven door Simon Stevin' ('Certain parts on the art of war, written by Simon Stevin'), contains a lengthy passage from *Huysbou* headed 'Vande oirdeningh der steden' ('On the layout of towns').<sup>9</sup>

In his publications, *Materiae Politicae: Burgherlicke Stoffen* ('Political subjects: civil matters') of 1649 and *Wisconstich Filosofisch Bedryf* ('Mathematical philosophical activity') of 1667, Hendrick Stevin sought to bring his father's academic legacy to the attention of a wider public.<sup>10</sup> In addition to 'Vande oirdeningh der steden', the first of these two publications contains an appendix entitled 'Vande oirdeningh der deelen eens huys' ('On the layout of parts of a house'). In it he attempted to present an accurate reconstruction of his father's ideas on the design and layout of dwellings, filling in gaps where necessary to provide a comprehensive theory. Constructional aspects were planned for an edition of the actual *Huysbou*,<sup>11</sup> but nothing came of this project. Yet Hendrick did include texts on the dredging of waterways and harbours in his chapter on 'Waterschuyring' ('Water scouring') which had originally been intended as part of his father's architectural treatise.<sup>12</sup> Stevin's observations on methods and materials, which his son did not subsequently include, were noted by other scholars. In addition to Beeckman's brief notes, in 1634 the renowned expert on Oriental manuscripts, Jacob Golius, edited Stevin's discourse 'Vande Molens' ('On mills'), which had probably been intended as an autonomous essay. Together with extracts from Stevin's 'Vande Spiegeling der Singconst' ('Theory on the art of singing'), it ended up in a collection of manuscripts owned by Constantijn Huygens.<sup>13</sup> Huygens also copied various fragments from Stevin's manuscripts, including *Huysbou*, and corresponded on the subject

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<sup>9</sup> The Hague, Koninklijke Bibliotheek (KB), manuscript 128-A-9-II, fol. 1-21, 'Vande oirdening der steden'.

<sup>10</sup> H. Stevin, *Materiae Politicae: Burgherlicke Stoffen*, (Leiden 1649) and *Wisconstich Filosofisch Bedryf van Hendrik Stevin*, (Leiden 1667).

<sup>11</sup> H. Stevin, 'Byvough der Stedenoirdening vande Oirdeningh der deelen eens Huys met 't gheene daer ancleeft', in *Materiae Politicae: Burgherlicke Stoffen*, (Leiden 1649), p. 40.

<sup>12</sup> H. Stevin, 'xi Boec, Vanden handel der Waterschuyring onses vaders Simon Stevin', in *Wisconstich Filosofisch Bedryf*, [Leiden 1667; fol. 37], published in *The Principal Works of Simon Stevin*, vol. v, p. 204: 'Angesien veel Huysen, Schansen ende Steden gebout worden op bedijckte landen, alwaer kennis vande gemene eygenschap der schuyring vorderlick is, soo sal ic nu daer af als totten huysbou gehoorende wat seggen'.

<sup>13</sup> Con. Huygens, 'Musica', 'Medica', 'Physica', 'Chijmica', 'Odorifera', 'Perfumatoria', 'Fusoria', 'Coquinaria', 'Philosophica', 'Mathematica', 'Artificialia Constantini Hugenii', 'Atque Formandarum Et Poliendarum Vitrorum Ad Usus Astronomicum', referred to as 'Manuscripts' (*Adversaria*),

with researchers abroad, so that the work even acquired a certain international renown.<sup>14</sup>

Yet the question remains, why did Stevin, essentially a mathematician and engineer, write a treatise on architecture? It is true that Maurice had urged him to publish his writings on architecture in *Wisconstighe Ghedachtenissen*, but that does not mean that he had commissioned them. As already noted, Stevin himself stated that he had recorded his observations on perspective for his own use in a separate architectural discourse. Thus the idea of writing about architecture may well have come from Stevin himself, with Maurice only becoming involved at a later stage in the choice and arrangement of certain fragments in *Wisconstighe Ghedachtenissen*. Moreover, there appears to have been a singular interest among scholars in the remaining manuscripts of the incomplete *Huysbou*, an interest which extended beyond Maurice's immediate entourage and even beyond the Low Countries. To understand why this was, it is necessary to examine the origins of Stevin's ideas on architecture and their significance within the development of architectural theory of the period.

Some answers may be found in what is known of Stevin's youth and education and in his earliest works. His special relationship with Maurice, repeatedly mentioned in connection with the treatise on architecture, is also significant, as are his contacts with members of the universities of the Dutch Republic, who may have influenced Stevin's thinking on science in general and on architecture in particular. Stevin's ideas about science help explain the theoretical premises of the architectural treatise, but *Huysbou* should also be seen in the context of architectural theory in the Low Countries and Europe in the second half of the sixteenth century.

### *Stevin's early years*

Although the studies of Bruges archivist Albert Schouteet have thrown some light on Stevin's early years, the education this celebrated scholar enjoyed as a boy remains shrouded in obscurity (ill. 1).<sup>15</sup> Stevin's earliest known activities

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manuscript of the Koninklijke Academie voor Wetenschappen on permanent loan to the KB in The Hague, KA XLVII. Both transcripts were first published in D. Bierens de Haan, *Vande Spiegeling der Singconst' et 'Vande Molens': Deux traités inédits*, (Amsterdam 1884).

<sup>14</sup> Huygens, 'Manuscripts' (Adversaria), fol. 146r-148r. See also C. de Waard (ed.), *Correspondance du P. Marin Mersenne Religieux Minime*, (Paris 1965), vol. ix, pp. 257-261 and 378-384.

<sup>15</sup> A. Schouteet, 'De afkomst van Simon Stevin en diens werkkring in Vlaanderen', in: *Handelingen van het Genootschap 'Société d'Émulation' te Brugge*, 80, (1937), pp. 137-146. Recently more information on Stevin's early life was brought together by Guido Vanden Berghe see, J.T. Devreese and G. Vanden Berghe, "W'onder en is gheen wonder". *De geniale wereld van Simon Stevin 1548-1620*, Leuven 2003, pp. 35-52.

focus not on Bruges – where he was born in 1548 to Antheunis Stevin and Cathelyne van der Poort – but on Antwerp, where he probably worked as a bookkeeper in the 1570s. In 1577, Stevin returned to his native town to take on another financial post in the Vrije van Brugge, an administrative body governing the districts surrounding Bruges. Coupled with the fact that his earliest publications were devoted to arithmetic and geometry, these posts indicate that Stevin had acquired at least an elementary knowledge of mathematics.<sup>16</sup> The earliest known work, *Nieuwe Inventie Van Rekeninghe Van Compaignie* (‘New invention of company bookkeeping’), published in Delft in 1581 and recently discovered under the name Simonem Stephanum, dealt with accounting.<sup>17</sup> This early interest in mathematics is also reflected in the texts published soon after in Antwerp: *Tafelen Van Interest* (‘Tables of interest’, 1582) and *Problematum Geometricorum* (1583).<sup>18</sup> Moreover, a couple of the earlier works – the famous *Thiende* and *L’Arithmetique*, both published in 1585 and presenting a new method of notation of decimal fractions – were also printed at the Plantijn Press after it had moved from Antwerp to Leiden.<sup>19</sup>

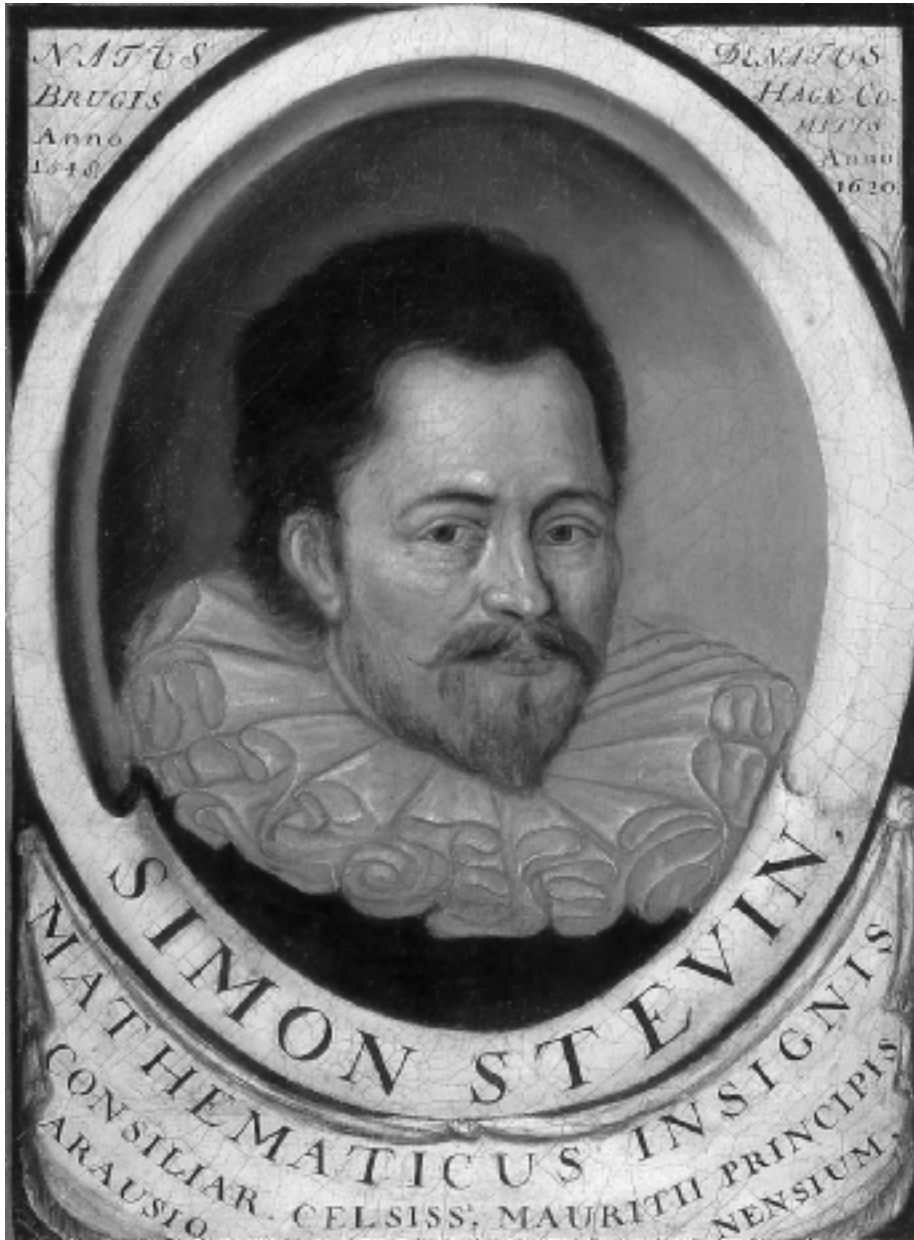
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<sup>16</sup> For Stevin’s first publications in Antwerp and Leiden see, *Bibliotheca Belgica: Bibliographie générale des Pays-Bas* [founded by Ferdinand Van der Haeghen; new edition under the direction of Marie-Thérèse Lenger], (Brussels 1964-1975), vol. v, pp. 214-215; L. Voet, *The Plantin Press (1555-1589): A Bibliography of the Works printed by Christopher Plantin at Antwerp and Leiden*, (Amsterdam 1980-83), vol. v, nos. 2256-2260; E. van Gulik, ‘Drukkers en Geleerden: De Leidse Officina Plantiniana (1583-1619)’, in: Th.H. Lunsingh Scheurleer and G.H.M. Posthumus Meyes (eds), *Leiden University in the Seventeenth Century: An Exchange of Learning*, (Leiden 1975), pp. 366-393 and D. Imhof, ‘Werken van Simon Stevin uitgegeven door Christoffel Plantijn’, in ‘*Spiegelingh en daet*’: *Simon Stevin van Brugghe (1540-1620), tentoonstelling Brugge Centrale Openbare Bibliotheek De Biekerf 9 december 1995-31 januari 1996*, [Bruges Public Library exhibition], pp. 23-31. Later works were published by various presses such as Franciscus I. Raphelengius (Plantin’s son-in-law) and Jan Bouwensz of Leiden and Jan van Waesbergh (former Antwerp bookseller) of Rotterdam. For Stevin’s mathematical works see *The Principal Works of Simon Stevin*, vols. II a and b on Mathematics and the recent supplement ‘De Thiende en andere Wisconstighe Ghedachtenissen’, in ‘*Spiegelingh en daet*’: *Simon Stevin van Brugghe (1540-1620), tentoonstelling Brugge Centrale Openbare Bibliotheek De Biekerf 9 december 1995-31 januari 1996*, [Bruges Public Library exhibition], pp. 30-43.

<sup>17</sup> Stevin’s earliest publication in Holland appeared in Delft in 1581, entitled *Nieuwe Inventie van Rekeninghe van Compaignie* [...], see R.M.Th.E. Oomes, ‘Een onbekend werk van Simon Stevin’, in *Vereniging Jan van Hout: Nieuwsbrief*, vol. 7, no. 1, (March 1996), pp. 2-4.

<sup>18</sup> S. Stevin, *Tafelen van Interest, midtsgaders de constructie derselver, ghecalculert door Simon Stevin Bruggelinck*, (Antwerp: Christoffel Plantijn, 1582) and *Problematum geometricorum: Libri v. Auctore Simone Stevinio Brugense*, (Antwerp: ‘Ioannem Bellerum’, s.d. [1583]). For the significance of Stevin’s arithmetics in contemporary Dutch scholarship, see M. Kool, ‘*Die conste vanden getale*’: *Een studie over de Nederlandstalige rekenboeken uit de vijftiende en zestiende eeuw, met een glossarium van rekenkundige termen* [PhD, University Utrecht], (Hilversum 1999).

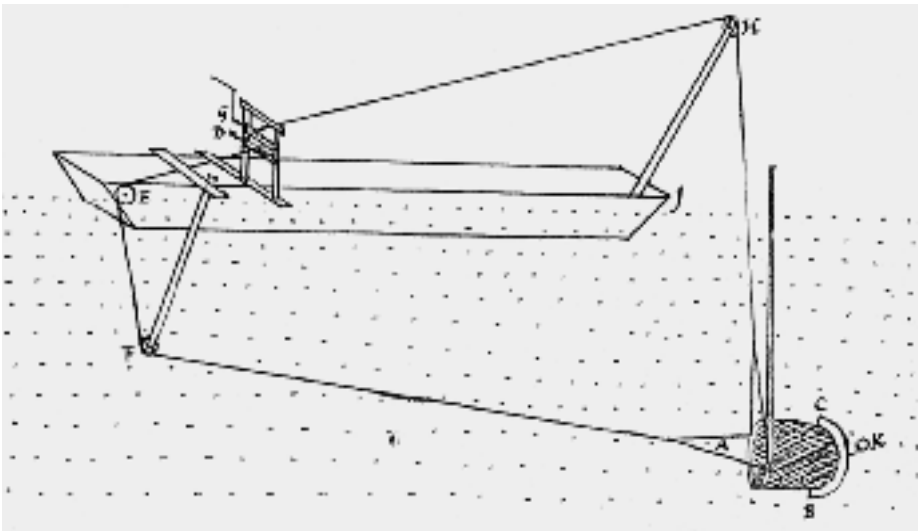
<sup>19</sup> S. Stevin, *De Thiende leerende door ongeboorde lichticheyt allen rekeningen onder den menschen noodich vallende afveerdighen door beele gbetalen sonder gbrokenen. Beschreven door Simon Stevin van Brugghe* (Leiden: Christoffel Pantijn, 1585). This key work was translated many times. See *L’Arithmetique de Simon Stevin*, (Leiden: Christoffel Plantijn, 1585).



Ill. 1 Portrait Simon Stevin, Leiden University Library, *Icones* 40

Whether or not Stevin had studied Latin before he journeyed north, in Leiden he had the chance to improve his knowledge of the language at the home of Nicholaas Stochius, rector of the Latin school, at whose home he lodged in 1581 (under more or less the same name – Symon Stephani – that he had used when publishing his first work). In 1584, three years after settling in Leiden, Stevin presented his first inventions in the field of hydraulic engineering to the Delft municipality and was granted patents by the States General and the States of Holland (ill. 2).

Clearly, even in his early years in Holland, he must have had an extensive knowledge of mechanics and civil engineering. Not long after, in 1586, the Plantijn Press in Leiden published Stevin's first works on mechanics and hydrostatics: *De Beghinselen der Weeghconst* ('The elements of the art of weighing'), *De Weegbdaet* ('The practice of weighing') and *De Beghinselen des Waterwichts* ('The elements of hydrostatics'), which contained the first serious discussion since Archimedes of the equilibrium of bodies on inclined planes. Indeed, Stevin subsequently incorporated his ingenious demonstration of the *clootcrans* ('wreath of spheres') which at one stage drew the attention of the former Nobel prize winner Richard Feynman. It demonstrated that, when in equilibrium, the weights of bodies on inclined planes are proportional to the lengths of the planes and that a *perpetuum mobile* can therefore not exist, into his



Ill. 2 Large dredge net which could be opened for drawing clay, sand and solid materials from the bottom of harbours and water-courses. Patent of the States-General (1589). The Hague, Nationaal Archief, VTHR 4795E

personal insignia, along with the device *Wonder is gheen wonder* ('Miracle is no miracle'), on the titlepages of his publications.<sup>20</sup>

Although these early publications and activities provide a general picture of Stevin's fields of interest, little is known of his education before he enrolled on 16 February 1583 at Leiden University as *Simon stevinus stud. litterarum*. In fact the rector of the Latin school patently failed to instill Stevin with a love of classical languages. Almost immediately after leaving Stochius's house, Stevin began to question the usefulness of Latin in the presentation of scientific problems. In his essay on dialectics and proofs – *Dialectike ofte Benyconst* – of 1585 Stevin listed his own recommended Dutch synonyms alongside the Latin terms, while in *Weegbconst*, published a year later, he praised the Dutch language, which he felt was more suitable than Greek or Latin for explaining his ideas, since Dutch employed many more cogent, mono-syllabic words.<sup>21</sup>

In short, Stevin's earliest publications and activities reveal his interest in the theory of mathematics and mechanics, his first experimental innovations in the field of civil engineering and hydraulics, as well as his particular concern for the use of Dutch in presenting information – all qualities that typified the scholar throughout his career.

In 1588, four years after his first plan for improving the regulation of water in Delft's canals, Stevin started developing water mills in partnership with Johan Hugo Cornets de Groot, later a burgomaster of Delft. In 1590, Stevin undertook a project of an entirely different nature for one of De Groot's predecessors, Govert Brasser. This was his *Vita Politica: Het Burgerlick Leven* ('Civic life'), a short study examining the relationship between public authorities and the citizen. The idea of expanding certain views in book form may perhaps have arisen from conversations between them. The preface, however, reveals that Stevin preferred not to pursue this subject for the time being since he had set himself a more important task in 'my present mathematical work, with which I hope to perform a useful service for the whole country'.<sup>22</sup> This

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<sup>20</sup> For a study of these works, J.T.L. Devreese, 'Simon Stevin Brugghelincck. Spiegeling en Daet', in: *'Spiegeling en daet': Simon Stevin van Brugghe (1540-1620)*, tentoonstelling Brugge Centrale Openbare Bibliotheek De Biekorf 9 december 1995-31 januari 1996, [Bruges Public Library exhibition], pp. 5-22. For Feynman's praise of Stevin's cloutcransbewys (wreath of spheres), idem p. 21.

<sup>21</sup> S. Stevin, *Dialectike ofte Benyconst*, (Leiden 1585), p. 2, on the Latin terms for which Stevin preferred to use Dutch synonyms; and idem, *De Beghinselen der Weegbconst*, [Leiden 1586], in *The Principal Works of Simon Stevin*, vol. 1, (Amsterdam 1955), pp. 35-289, esp. 59-93: 'De Weerdicheyt der Duytsche tael'. On Stevin's views on the significance of Dutch for the presentation of scientific problems see M. Kool, 'De rekenkundige termen van Simon Stevin', in *Scientiarum Historia*, (1992), pp. 91-107.

<sup>22</sup> S. Stevin, *Vita Politica: Het Burgerlick leven, beschreven deur Simon Stevin*, [Leiden 1590; p. 6], in *The Principal Works of Simon Stevin*, vol. v, (Amsterdam 1966), p. 481: 'oeffeninghe in wisconstighe

plan came to fruition some fifteen years later with the publication of *Wisconstighe Ghedachtenissen*.

Meanwhile, two significant events had taken place in Stevin's life which were to prove crucial for his future publications. After serving in the Dutch Republic's army as an engineer, Stevin was officially assigned to the post of quartermaster. Even more important was his appointment to the highly influential position of private tutor to and controller of the financial administration of the domains and private household of Stadholder, later Prince Maurice. It was as a bookkeeper that he wrote *Van de Vorstelicke Bouckhouding in Domeine en Finance Extraordinaire*, which was incorporated in various publications, including the second volume of *Wisconstighe Ghedachtenissen* in 1608.<sup>23</sup> Stevin's conclusion was in essence that the so-called Italian manner of double-entry bookkeeping, generally employed by merchants, should serve as the basis for the Stadholder's accounts. And indeed, his recommendations were adopted, as the recent discovery of a journal and ledger for the years 1604 and 1605 employing and explaining Stevin's system demonstrates. These books, bound in parchment and bearing the Stadholder's arms, were probably presented to Maurice by Stevin in 1606.<sup>24</sup> If Simon Stevin's son Hendrick is to be believed, these reforms were successful and his father continued to keep a tight rein on his patron's finances as superintendent until his death in 1620.<sup>25</sup> Meanwhile, he simplified his system even further in his *Verrechting der Domeine mette Contrerolle en nadere behouften van dien*, published posthumously in 1649. In fact, after *Wisconstighe Ghedachtenissen* and the volumes on bookkeeping of 1607 and 1608, only two other works by Stevin appeared in print in his lifetime. These were published in 1617 in Rotterdam – *Castrametatio, Dat is Legermeting* and *Nieuwe Maniere van Sterctebou door Spilshuysen* – works that were generally to appear in combined volumes. *Wisconstighe Ghedachtenissen*, *Vorstelicke Bouckhouding* and the latter discussions of military affairs clearly reflect Stevin's position as Maurice's

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daet [Praxi Mathematica], daer mede wy hopen te doen nutten dienst an tghemeene landt'. Stevin later wrote a sequel to this work that his son included in his *Materiae Politicae* of 1649. For a recent edition and study of this work, P. den Boer, *Simon Stevin, Het Burgbelick Leven*, Utrecht 2001

<sup>23</sup> In 1607 an edition was dedicated to the Superintendent of Finances of the King of France, Duc de Seully. Editions also appeared in translation. See Waal (1929), Dijksterhuis (1943) p. 52 and Chapter XI; on the international significance of Stevin's works on bookkeeping see Geysbeek (1914).

<sup>24</sup> The Hague, Nationaal Archief (NA), Nassause Domeinraad.1.08.11, inv. nos. 1439 and 1440; I am indebted to Kees Zandvliet (Rijksmuseum Amsterdam) for drawing my attention to these accounts. See C. van den Heuvel, "'Wisconstighe Ghedachtenissen': Maurits over de kunsten en wetenschappen in het werk van Stevin', in K. Zandvliet (ed.), *Maurits, Prins van Oranje*, Rijksmuseum exhib. cat. (Amsterdam 2000), pp. 110-111 and pp. 276-277.

<sup>25</sup> H. Stevin, *Wisconstich Filosofisch Bedryf* (1667), 1 *Boec Vant aenleggen ter wisconstige filosofi*, p. 6.



private tutor, financial superintendent and quartermaster – a significantly more prestigious and lucrative position than many until recently have thought.<sup>26</sup>

### *Stevin and Maurice*

When William the Silent was killed by an assassin's bullet in Delft on 10 July 1584, his son Maurice was only seventeen years old. A year later, he was appointed stadholder of Holland and Zeeland, in 1587 he became captain general of the army and admiral of the fleet of the States of Holland and in 1590 stadholder of Gelderland, Utrecht and Overijssel. Despite his success on the battlefield, some members of his family, particularly the German branch, were concerned at the awesome responsibilities Maurice had taken on. In 1590, Maurice's cousin, William Louis of Nassau, convinced his father, Jan the Elder, Count of Nassau, not to send his brothers to the court in The Hague. He considered it no place for a young aristocrat, a den of French iniquity. He preferred to keep them at his own court in Leeuwarden, where they could study Latin and geometry until they reached eighteen.<sup>27</sup> But the young Maurice surrounded himself with advisors such as Grand Pensionary Johan van Oldebarneveldt, who remained Maurice's councillor in administrative and political affairs almost all his life, and Stevin, who became Maurice's tutor and advisor on fortifications. In 1594, William Louis relented and sent his younger brother to The Hague after all, begging Maurice to ensure that he practised his geometry. Perhaps William Louis thought the time now ripe, having heard that Maurice had appointed the mathematician Simon Stevin as his private teacher.

Opinions differ as to when Maurice first took lessons from Stevin. It has been suggested that he was already the latter's pupil when they both enrolled at Leiden University in the early 1580s.<sup>28</sup> Others have proposed a date some ten years later. In fact it seems likely that Stevin became Maurice's tutor around 1593. In December 1603, Maurice urged the States General to provide Stevin with a salary, since he had served ten years in the army as quartermaster

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<sup>26</sup> The recently rediscovered journal, The Hague, NA, Nassause Domeinraad.1.08.11, inv. nos. 1439 fol. 88, reveals that Stevin enjoyed an annual grant of 600 guilders. Until recently he was only known to have received fifty guilders a month or 600 guilders a year as quartermaster of the States army, working 32 hours each month. See F.J.G. ten Raa and F. de Bas, *Het Staatse Leger*, vol. II, p. 117. This was paid by the Council of State from 1603. So it seems likely that Stevin had a double income.

<sup>27</sup> J. Postema, *Joban van den Corput (1542-1611)*, (Kampen 1993), p. 118.

<sup>28</sup> Cf. E.J. Dijksterhuis, *Simon Stevin*, (The Hague 1943), p. 10, n.1.

without drawing pay.<sup>29</sup> E.J. Dijksterhuis rightly concluded that since Stevin had received no wages for his services in the army he must have been paid by Maurice.<sup>30</sup> In 1594, Stevin published a treatise on fortifications under the title *Sterctenbouwing*. It has generally been assumed that the publication was the result of Stevin's contacts with Maurice and that he had had a hand in the military reforms which his pupil and Maurice's cousin William Louis had embarked upon around 1590. However, this assumption requires some qualification.<sup>31</sup> It is striking, for example, that *Sterctenbouwing* contains no reference whatever to Maurice or his involvement in military affairs. Moreover, the work was completed in Delft and not in The Hague, where Stevin settled almost immediately to be near the Stadholder. And finally, the work does not set out to be a detailed study of the construction of Dutch fortifications in practice; presenting existing knowledge rather than a new theory of fortifications.<sup>32</sup> Indeed, Stevin may have started on his *Sterctenbouwing* before he became directly concerned with the military and perhaps Maurice only decided to involve his teacher more closely in the reform of the army after he had become acquainted, through his mathematics lessons, with this first essay by Stevin on fortification construction.

Either way, the close relationship between Stevin and his pupil, and his involvement in the sieges of the 1590s and later, were to have a profound influence on Stevin. It is precisely this combination of didactic qualities and a knowledge of the practice of warfare that must have persuaded Maurice to ask Stevin to prepare a program for an academy that would provide him with a rapid supply of engineers. As part of the course on fortification construction, this academy – *Duytsche Mathematique* – provided pupils with lessons, taught

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<sup>29</sup> Resolutions of the Council of State, 23 December 1603, quoted in *ibid.*, p. 10: 'als affteeckenaer der Quartieren in 't Legher; twelck hij niet langher om niet en behoorde te doen, gelijk hij nu tien jaren gedaen hadde'.

<sup>30</sup> *Ibid.*

<sup>31</sup> For the military reforms see W. Hahlweg, *Die Heeresform der Oranier und die Antike*, (Berlin 1941); *idem*, 'Askpekten und Problemen der Reforms des niederländischen Kriegswesens unter Prinz Moritz von Oranien', in: *Bijdragen en mededelingen betreffende de geschiedenis der Nederlanden*, vol. LXXXVI, (1971), pp. 161-177 and J.P. Puype, 'Hervorming en uitstraling: Tactiek en wapens van het Staatse leger tot de Vrede van Munster en hun invloed in andere Europese landen', in J. Dane (ed.), *1648 Vrede van Munster, Feit en verbeelding*, (Zwolle 1998), p. 47-81. For the exaggerated emphasis on the part played by Maurice and Stevin in military reform and the underestimation of that of William Louis, see J. Postema, *Johan van den Corput (1542-1611)*, (Kampen 1993), chapter 6. See also C. van den Heuvel, "'Wisconstighe Ghedachtenissen" [...]', (Amsterdam 2000).

<sup>32</sup> Cf. C. van den Heuvel, *'Papiere Bolwercken': De introductie van de Italiaanse stede- en vestingbouw in de Nederlanden (1540-1609) en het gebruik van tekeningen*, (Alphen aan den Rijn 1991), pp. 141-142.

in Dutch, in elementary mathematics and surveying but ‘only as much of each as is necessary for a general practical knowledge of engineering’.<sup>33</sup>

*Castrametatio, Dat is Legermeting* – published in Rotterdam in 1617 together with *Nieuwe Maniere van Sterctebou door Spilshuysen* – presents the first theoretical results of Stevin and Maurice’s joint interest in military affairs. In this work, described by Stevin as following Maurice’s own methods and practice – ‘Na d’oordeningh en ’t ghebruyc’ (‘arrangement and usage’) – he took up the Stadholder’s suggestion, applying classical theories about military camps to the exigencies of the Eighty Years’ War. Other indications also suggest that Maurice made a more direct contribution to his teacher’s theories.<sup>34</sup> For *Vant Beleggheren Der Steden en Sterckten* – a work only known from a transcript by Hendrick Stevin – a passage was borrowed from ‘Omringelingen van sijn Extie.’ (‘Fortifications by his Excellency’), and Beeckman came across ‘Syn Excellenties teyckeningen ende schrif’ (‘His Excellency’s drawings and writings’) among Simon Stevin’s documents after his death.<sup>35</sup> While it seems likely that Maurice, with his experience of the practice of warfare, might indeed have contributed to Stevin’s theories on the military arts, it is debatable whether the author’s laudatory remarks about his pupil’s contributions in other scientific

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<sup>33</sup> P.C. Molhuysen, *Bronnen tot de geschiedenis der Leidse Universiteit*, 7 vols., *Rijks Geschiedkundige Publicatiën*, 20, (The Hague 1913-1924), vol. 1, p. 122: ‘Maer alleenlyck soe veel, als tottett dadelick gemeene ingenieurscap nodich is’. For the engineering course see, E.R.M. Taverne, *In ’t land van belofte: in de nieuwe stad. Ideaal en werkelijkheid van de stadsuitleg in de Republiek 1580-1680*, (Maarsse 1978), pp. 61-69 and 75-81; P.J. van Winter, *Hoger beroepsondervijns avant-la-lettre: Bemoeiingen met de vorming van landmeters en ingenieurs bij de Nederlandse universiteiten van de 17<sup>e</sup> en 18<sup>e</sup> eeuw*, (Amsterdam/Oxford/New York 1988) and F. Westra, *Nederlandse ingenieurs en de fortificatie-werken in het eerste tijdperk van de Tachtigjarige Oorlog, 1573-1604*, (Alphen aan den Rijn 1992), pp. 82-89. Recently a publication and a manuscript of 1600 by J. Paedts Jacobsz with the original text of the program has been discovered. See, C. van den Heuvel, ‘Simon Stevin, De Crychconst en de Duytsche Mathematique/Le traité incomplet de l’Art Militaire et l’instruction pour une école des ingénieurs de Simon Stevin’, *Simon Stevin(1548-1620) De geboorte van de nieuwe wetenschap Simon Stevin (1548-1620)/L’emergence de la nouvelle science*, (tentoonstellingscatalogus/ catalogue Koninklijk Bibliotheek Albert I, Brussel/Bibliothèque Royale Albert I, Bruxelles, 17-09-2004-30-10-2004) Brussels 2004, pp. 101-111. I am indebted to R.M.Th.E. Oomes for drawing my attention to these texts.

<sup>34</sup> See Van den Heuvel, *op. cit.*, in K. Zandvliet (ed.), *Maurits, Prins van Oranje*, Rijksmuseum exhib. cat. (Amsterdam 2000).

<sup>35</sup> The text of ‘Vant beleggheren der Steden en Stercken’ from KB 128-A-9-II is included in *The Principal Works of Simon Stevin*, vol. IV, (Amsterdam 1964), pp. 399-468, esp. 418 and C. de Waard, *Journal tenu par Isaac Beeckman de 1604 à 1634*, vols. I-IV, (The Hague 1939-1953), vol. II, p. 291. See also, C. van den Heuvel, ‘De Huysbou, de Crychconst en de Wysentijt: Stevins teksten over architectuur, steden- en vestingbouw in het licht van zijn wetenschappelijke oeuvre’, in *Spiegelingh en daet: Simon Stevin van Brugge (1540-1620), tentoonstelling Brugge Centrale Openbare Bibliotheek De Biekorf 9 december 1995-31 januari 1996*, [Bruges Public Library exhibition], pp. 45-70 and C. van den Heuvel, *Simon Stevin, ‘De Crychconst/Le traité incomplet’*, (Brussels 2004).

texts were entirely sincere. After all, the scholarly warrior and the young aristocrat with a thirst for knowledge were familiar types in literature on the education of aristocrats at court.<sup>36</sup> Even a personal friend of Stevin, Hugo de Groot (Grotius), attributed *Wisconstighe Ghedachtenissen* to Maurice in his *Mathematica Principis Mauriti* and referred in his *Parallelon rerumpublicarum* to the books that the *allerschranderste Veldbeer* ('most brilliant general') had written.<sup>37</sup> It is an image that was only placed in proper perspective centuries later by Johan Meerman, who annotated the Dutch edition of De Groot's *Parallelon*.<sup>38</sup> Since then it has generally been assumed that the two wrote the work together.

The exchange of information and ideas between Stevin and Maurice must have taken place mainly during tutorials. Even when Maurice was away on campaign, Stevin accompanied him – which accounts for the lack of correspondence between them. Information on their relationship is from third parties, like the letter to a friend from Ubbo Emmius – later rector of Groningen University – which mentions Stevin's heliocentric ideas.

I gather that a large work has been published, which bears the name of our Prince Maurice on the title page; it contains his *Wisconstighe Ghedachtenissen* [and] is published by Simon Stevin, mathematician and friend of the Prince [...] Indeed if these things are true, as I understand them, the writer vehemently declares that Moses is a liar and the entire Holy Scriptures are untrue. I regret that the name and the studies of the Prince are sullied by this filth.<sup>39</sup>

This description of Stevin as a Rasputin *avant la lettre*, abusing his patron's friendship to propagate subversive ideas, would hardly have been taken seriously by many contemporaries. Naturally, Maurice would not have been impervious to the eulogies heaped on him by his teacher and Stevin, in his position as tutor, might occasionally have been able to prevail upon him for favours. Nor can the possibility be ruled out that Stevin may have had some influence on the choice of professors whom Maurice, often unsuccessfully, proposed for Leiden University and Duytsche Mathematique. Yet the intimacy between

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<sup>36</sup> See the famous discussion by B. Castiglione, *Il cortegiano*, 1528. See also N. Macchiavelli, *Il principe*, 1513 and F. de la Noue, *Discours politiques et militaires*, 1587. On the theme of the scholarly warrior see also Puddu (1982).

<sup>37</sup> A. Eyffinger, "The poetry of Hugo Grotius. Original Poetry 1602-1603" edited by Arthur Eyffinger, in: *De dichtwerken van Hugo Grotius in opdracht van de Grotius commissie van de Koninklijke Nederlandse Akademie van Wetenschappen uitgegeven door het Grotius Instituut 1 Oorspronkelijke Dichtwerken Tweede Deel, pars 3 A en B*, (Assen 1988), p. 128-130.

<sup>38</sup> A. Meerman, *Hugonis Grotii, Batavi, Parallelon Rerumpublicarum [...]*, (Haarlem 1801-1802).

<sup>39</sup> Quoted in Dijksterhuis, Simon Stevin, p. 331. For Stevin's astronomy and for his heliocentric views, see, R. Vermij, *The Calvinist Copernicans. The reception of the new astronomy in the Dutch Republic, 1575-1750*, Amsterdam 2002.

Stevin and Maurice was neither as unusual nor as exclusive as historians have suggested.<sup>40</sup> Maurice had a large circle of advisers, while Stevin for his part maintained scientific contacts which extended far beyond the confines of his patron's study.

### *Stevin and the academic world*

The northern provinces of the Low Countries occupied a marginal position in the cultural and academic world of Europe in the first half of the sixteenth century. While they had produced some prominent artists and scholars, those with any substantial talent usually headed south. For 125 years the University of Louvain, founded in 1425, remained the only seat of advanced learning in the Low Countries. But while scholars such as Erasmus and Gemma Frisius had left the North early in the sixteenth century to pursue their scholarly ambitions, this trend was soon reversed when the Dutch Revolt began in earnest. Particularly after the Sack of Antwerp in 1585, thousands migrated to the North, among them eminent scholars such as Plancius, Lipsius, Lansbergen, Marolois and Van Schooten. Stevin's move to Holland was part of a brain-drain from the South that made a deep impression on cultural and intellectual life in the young Republic.

When Stevin arrived in Holland, the North had only one university: the Hogeschool in Leiden, founded in 1575 on the initiative of William the Silent as a bulwark against Spanish tyranny.<sup>41</sup> After the Act of Abjuration of 1581, when Philip II was renounced and replaced briefly by the Duke of Anjou, each province acquired the right to set up its own university. Although originally intended as a temporary solution following Anjou's death in 1583, the negative experience of offers of allegiance to France and England convinced the Dutch to end their reliance on foreign support. With the formation of the Republic of the United Netherlands in 1588, the States General became the sovereign body. By 1585 the University of Franeker had been founded; Groningen followed in 1614, Utrecht in 1636 and Harderwijk in 1648. There were also several

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<sup>40</sup> For the literature on the relationship between Stevin and Maurice, see J.P. van Capelle, 'Maurits en Stevin', in *Bijdragen tot de Geschiedenis der Nederlanden*, (Haarlem 1827), pp. 285-299. Dijksterhuis, *Simon Stevin*, pp. 321-332, H.A.M. Snelders, 'Simon Stevin: De leermeester van Prins Maurits', in: H.L. Houtzager e.a. (eds), *Kruit en Krijg: Delft als bakermat van het Prins Maurits Laboratorium TNO*, (Amsterdam 1988), pp. 3-30, H.H. Kubbinga, 'Stevin en Maurits', in: *De zeventiende eeuw*, vol. 10, no. 1, (1994) pp. 93-102 and C. van den Heuvel, "Wisconstighe Ghedachtenissen" [...]', (Amsterdam 2000).

<sup>41</sup> Molhuysen, vol. 1, (1913), Bijlagen, p. 2\*.

Illustrious Schools, on a par with the universities, such as the Athenaeums of Deventer (1630) and Amsterdam (1632).<sup>42</sup>

The first universities to emerge in Stevin's time adopted programmes on the medieval European model. The three principal faculties of theology, medicine and law were accompanied by a fourth, propaedeutic faculty of philosophy or humanities. It was with the latter that Stevin enrolled at Leiden; subjects included dialectics, rhetoric, ethics, metaphysics, natural philosophy or physics, ancient languages – particularly Greek and Hebrew – and mathematics.

Although the universities of the Northern Low Countries were organised along traditional lines, they gradually developed their own character and curriculum around the turn of the seventeenth century. Education in the Southern Low Countries already had an unusually practical emphasis compared with the rest of Europe. Gemma Frisius, originally from Dokkum and professor of medicine at Louvain from 1541, wrote arithmetic books in Latin. These were widely used by schoolchildren and acquired a considerable reputation due to his system of triangulation which led to a breakthrough in surveying. His most eminent pupil was the famous cartographer Gerardus Mercator, while Jacob van Deventer probably used Frisius's system to produce his maps of the provinces. In the wealthy commercial city of Antwerp much energy was devoted to the scientific study of navigation, mathematics, cosmography and accounting, precisely because of their practical applications. In addition, Michel Coignet's works on arithmetic, navigation and his practical metrological instruments were widely influential in that city; while the Jesuit Francisco d'Aguilon, who wrote a seminal treatise on perspective (1613), was appointed to his order's college in Antwerp where his tasks included teaching natural sciences with a bearing on trade, navigation, architecture and military science.<sup>43</sup> Although Aguilon's school of mathematics was founded in 1617 and the study of applied natural sciences did not entirely disappear with the Sack of Antwerp, in the North practical education was stimulated on a far greater scale by the expansion of commercial activity.

Information about foreign seas and countries played an essential part in the growth of overseas trade. In 1584, the first genuine nautical atlas – *Spiegel*

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<sup>42</sup> K. van Berkel, 'Universiteit en natuurwetenschap in de 17<sup>e</sup> eeuw, in het bijzonder in de Republiek', in: *Natuurwetenschappen van Renaissance tot Darwin, Thema's uit de wetenschapsgeschiedenis, compiled and introduced by Prof. H.A.M. Snelders and Drs K. van Berkel*, (The Hague 1981), pp. 107-130, 109-110; idem, *In het voetspoor van Stevin: Geschiedenis van de natuurwetenschap in Nederland 1580-1940*, (Amsterdam 1985), pp. 28-29.

<sup>43</sup> A extremely well-documented study of the history of natural science at Antwerp with much new information about Coignet, the mathematics masters and the Jesuit school of mathematics at Antwerp, was written by A. Meskens, *Wiskunde tussen Renaissance en Barok: Aspecten van wiskunde-beoefening te Antwerpen 1550-1620*, (Antwerp 1995).

*der Zeevaert* – by the Dutch navigator Lucas Jansz Waghenaer, appeared, complete with texts for navigators and attractive nautical charts extending from the Baltic to Spain. This was followed by many other atlases and manuals, charting hitherto unknown seas in ever greater detail. Jan Huygen van Linschoten published his *Iternario: Voyage ofte Schipvaert naar Oost oft Portugaals Indien 1579-1592* after returning from service in the Portuguese and Spanish navies. Observations recorded by navigators led to the formulation of a theory of nautical orientation which proved of practical use in the education of young navigators and in the invention of even more accurate optical and metrological instruments. Petrus Plancius, for example, provided his pupils with an improved method of determining longitude at sea using a magnetic needle, while Stevin, in his *Havenvinding* of 1599, developed his own theories and those of contemporaries into a practical guide to navigators seeking a coastline or safe entry into a harbour.<sup>44</sup>

Economic and territorial expansion also took place closer to home. Wealthy Dutch patricians and merchants invested in the drainage of lakes and inland seas; with a rapidly growing population, this presented a lucrative investment. It also encouraged innovations in engineering. Scientists and skilled craftsmen vied with each other for patents. Grand Pensionary Jacob Cats, the scholar Isaac Beeckman and the renowned hydraulic engineer Jan Adriaansz Leeghwater all developed new techniques for the more efficient draining of waterlogged land. Similar economic interests are reflected in Stevin's civil engineering patents, as well as his posthumously published discourse on mills, 'Vande Molens'.<sup>45</sup>

The impetus to develop science along practical lines did not initially come from the universities. At first it was teachers and private tutors who met the demand for knowledge from merchants, navigators and craftsmen.<sup>46</sup> Where this

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<sup>44</sup> Stevin was later to include his *Havenvinding* in *Wisconstighe Gebdachtenissen*. For an overview of the relations between maritime affairs and science, see C.A. Davids, *Zeevezen en wetenschap: De wetenschap en de ontwikkeling van de navigatietechniek in Nederland tussen 1585 en 1815*, (Amsterdam/Dieren 1986).

<sup>45</sup> These are just a few of the many examples cited by Dirk Struik in his splendid study on the main scientific developments made in the young Republic: D.J. Struik, *Het land van Stevin en Huygens*, (Amsterdam 1958). For more recent information on scientific developments in the Low Countries in the 16th and 17th centuries, see E. Jorink, *Wetenschap en wereldbeeld in de Gouden eeuw*, (Hilversum 1999), R. Vermij, *De wetenschappelijke revolutie*, (Amsterdam 1999) and, F. Egmond, E. Jorink and R. Vermij, *Kometen, monsters en muilezels. Het veranderde natuurbeeld en de natuurwetenschap in de zeventiende eeuw*, (Amsterdam 1999).

<sup>46</sup> For the development of education from private tutors to organised institutions in navigation, see for example: C.A. Davids, 'Ondernemers in kennis: Het zeevaartkundig onderwijs in de Republiek gedurende de zeventiende eeuw', in: *De zeventiende eeuw*, vol. 7, no. 1, (1991), pp. 37-48.

was not met quickly enough, however, as in the training of competent surveyors and military engineers, the authorities stepped in – as Maurice's Duytsche Mathematique initiative illustrates.

In the early seventeenth century the scientific infrastructure in this land of schoolmasters and independent scholars was still largely unformed. When not giving university lectures, many teachers continued to teach privately. The huge demand for practical knowledge in an ever-growing economy resulted not only in rivalry between private employers in education, but also prompted the new university establishments to radically alter the traditional syllabus and choice of professors.

Despite assertions by some authors, Stevin never actually taught at Leiden, although he certainly remained involved in developments at Leiden University and Duytsche Mathematique. While serving as Maurice's private tutor he apparently enjoyed considerable contact with eminent members of both establishments. Stevin himself recounted that Josephus Julius Scaliger, the famous Italian humanist, philologist and orientalist from the early years of Leiden University, had personally shown him the difference in figures of the celestial globes and in arithmetical notation systems, in the works that preceded the theories of the famous Greek astronomers and those that had been preserved in Arabic manuscripts.<sup>47</sup> Furthermore, Stevin was probably in contact with Ludolf van Ceulen and Symon Fransz van Merwen, the first professors at Duytsche Mathematique, where he organised the syllabus.<sup>48</sup> Stevin also remained in touch throughout his life with his contemporary Rudolf Snellius (1546-1613) and with his son Willibrord (1580-1626). Stevin was probably still a student when he first met Rudolf Snellius, who had already been appointed associate professor at Leiden University. Snellius's promotion to a full professorship in 1601 was probably directly connected with developments at Franeker University, which in turn were prompted by the founding of chairs in mathematics at Duytsche Mathematique.<sup>49</sup> The first professor of mathematics at Franeker was a certain Roggius. He had been promoted in 1592 to an associate professorship, his function as inspector of the boarding-house attached

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<sup>47</sup> See, S. Stevin, 'Wysentijt', in *The Principal Works of Simon Stevin*, vol. III, (Amsterdam 1961), pp. 594/5 and 600/601.

<sup>48</sup> It is known, for example, that in the period when Stevin was living in Delft, Ludolf van Ceulen gave fencing lessons and had personal contact with the De Groot family with whom Stevin was also friendly. For Ludolf van Ceulen and Van Merwen, see, R.M.Th.E. Oomes, *II in de bibliotheek. Catalogus bij een tentoonstelling over Ludolf van Ceulen en de berekening van het getal Pi, in de Leidse Universiteitsbibliotheek 4-18 juli 2000*, (Leiden 2000)

<sup>49</sup> K. van Berkel, 'A note on Rudolf Snellius and the early history of mathematics in Leiden', in: C. Hay (ed.), *Mathematics from Manuscript to Print 1300-1600*, (Oxford 1988), pp. 156-161.



to Franeker having become untenable following quarrels with the students. This only stirred up more trouble until eventually, in a brawl, someone was killed; two years later Roggius disappeared from the scene, albeit with an honourable discharge.<sup>50</sup> He was succeeded in 1598 by Adriaan Metius, son of a burgomaster of Alkmaar, Adriaan Anthonisz Metius, who had designed many fortifications for Maurice and the States General. Metius had spent three years studying at Franeker before moving to Leiden in 1594 to study with Rudolf Snellius; from there he proceeded to the Danish island of Hven, where Tycho Brahe taught.<sup>51</sup> Besides theory and mathematics, Metius also gave practical lessons, which he held in Dutch, on navigation, surveying and fortifications. William Louis, patron of Franeker University, may well have been instrumental in bringing Metius back, especially to teach these subjects.<sup>52</sup>

Although practical education for engineers and surveyors formed an integral part of the syllabus at Franeker, Maurice nevertheless created a separate course for these subjects at Leiden. It is hardly coincidental that on 22 April 1600, a few months after the foundation of Duytsche Mathematique, Metius was promoted from associate to full professor at Franeker. Followed, as already noted, a year later by Rudolf Snellius. After all, Leiden University could hardly be seen to lag behind Franeker, while Duytsche Mathematique, with two full mathematics professorships, could not be allowed to become overly self-sufficient. Although the engineering course under Van Ceulen and Van Merwen had been endorsed, the governors of the university nevertheless appointed Snellius as an external examiner or supervisor in 1602.<sup>53</sup>

Clearly, Stevin continued to keep abreast of developments at Franeker and Leiden universities: the son of the engineer with whom Stevin had worked for many years was now professor at Franeker, while his former teacher, Rudolf Snellius, was professor at Leiden. These two had kept in touch, both having served on a committee of the States of Holland for the assessment of patents shortly before the latter's appointment.<sup>54</sup> Stevin also maintained strong

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<sup>50</sup> A. den Oudsten, 'Het mathematische onderwijs aan de Franeker hogeschool', in: *De hemel is gestegen of de aarde is gedaald*, exhib. cat., (Franeker: Museum 't Coopmanhø, 10 August to 31 October 1981), pp. 11-22.

<sup>51</sup> J.R. Christianson, *On Tycho's Island: Tycho Brahe and his Assistants 1570-1601*, (Cambridge 2000).

<sup>52</sup> With regard to the relationship between William Louis's military reforms and the educational programme at Franeker University, it is interesting that the Greek professor at this university, Sixtus Arcerius, published new editions of the books on military science by Aelianus and Emperor Leo IV. Stevin worked on a translation of Aelianus. Thus the transcript 'Eenighe stucken der Crychconst beschreven door Simon Stevin' contained a 'Verduytsing van Elianus grieksche woorden', KB 128-A-9-II, fol. 86r-95r.

<sup>53</sup> P.J. van Winter, *Hoger beroepsonderwijs avant-la-lettre*, p. 19.

<sup>54</sup> Resolution of the States of Holland, 13 March 1598. See also 'Navigation', in *The Principal Works of Simon Stevin*, vol. III, (Amsterdam 1961), p. 389.

ties with Willibrord Snellius, who followed in his father's footsteps in 1613. The latter not only translated *Wisconstighe Ghedachtenissen* into Latin, Stevin also asked him to be guardian to his children.<sup>55</sup> This indication of Stevin's intimacy with the Snellius family suggests that they probably also exchanged ideas on science. Rudolf Snellius was the most eminent exponent in the Low Countries of Pierre de la Ramée's controversial ideas, while Willibrord translated his works and published commentaries on the subject.<sup>56</sup> This French scholar, better known as Petrus Ramus, had made his name with a fierce critique of Aristotelian theory in *Aristotelicae Animadversiones* (1543) and *Dialecticae Partiones Sive Institutiones* published in the same year.<sup>57</sup> This subject, to which Stevin had also devoted an early publication, prompted yet another work, *Dialecticae Libri Duo*, which appeared after Ramus's death in 1572, with later editions in various languages.<sup>58</sup> These volumes reveal Ramus to have been a student of didactics, more concerned with the form in which information was presented than its substance. In his *Prooemium Mathematicum* (1567), a critique of Euclid's *Elements*, Ramus even proposed that passages which had no demonstrable practical application should be scrapped from the textbooks. Although more temperate in his critique of Aristotelianism than Ramus, Snellius was nevertheless regarded with suspicion by leading scholars at the university, including the humanists Justus Lipsius and Josephus Justus Scaliger.<sup>59</sup> They feared that the authority of the classics would be undermined. In Germany, on the other hand, Snellius's commentaries on Ramus's discussions of dialectics, arithmetic and geometry were extensively translated and widely circulated among students.<sup>60</sup> The introduction of a scientific world view based on the experiments

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<sup>55</sup> Dijksterhuis, *Simon Stevin*, p. 20. The request, however, was not honoured by the high court, the Hof van Holland.

<sup>56</sup> For Ramism in the Low Countries, see Van Berkel, *Isaac Beeckman* and P. Dibon, 'L'influence de Ramus aux universités néerlandaises du XVII<sup>e</sup> siècle', in: *Proceedings of the XIth International Congress of Philosophy*, vol. XIV, (Brussels 1953) pp. 307-311 (Reprinted in the collected essays of P. Dibon, *Regards sur la Hollande du Siècle d'Or*, [Naples 1990], pp. 79-85).

<sup>57</sup> Ramus wrote of Aristotle: 'Quaecumque ab Aristotele docta esse commanticia' / 'Everything that Aristotle taught is invented'. Quoted by Struik, *Het land van Stevin en Huygens*, p. 39.

<sup>58</sup> W.J. Ong, *Ramus and Talon inventory: A short-title inventory of the published works of Peter Ramus (1515-1572) and of Omer Talon (ca. 1510-1562) [...]*, (Cambridge Mass. 1958).

<sup>59</sup> Van Berkel, 'A note on Rudolf Snellius', p. 158.

<sup>60</sup> Van Berkel refers in *Isaac Beeckman*, p. 279, to a 'Ramist subculture' in Leiden. Ramism was much more widespread in Germany where Snellius first encountered Ramus's ideas. He taught this branch of philosophy in Marburg where he was appointed *magister artium* in 1572 and where the summary of his lectures was published, initially without his permission, and later in his own revised edition. See K. van Berkel, 'De geschriften van Rudolf Snellius, een bijdrage tot de geschiedenis van het ramisme in Nederland', in: *Tijdschrift voor de geschiedenis der geneeskunde, natuurwetenschappen, wiskunde en techniek*, vol. 6, (1983), pp. 185-194.

and notions of craftsmen and artisans must also have appeared to threaten the university's authority. Controversially, Ramus had advised his students to visit forges and carpentry workshops not only to test whether their mathematical propositions could be applied in practice, but also to purge existing expertise of superfluous elements.<sup>61</sup> His followers, including Snellius and Beeckman, were to introduce similar concepts in the Republic.

The first indication that craftsmen were taking part in the education system is found in Leiden, although this was outside the confines of the university. Stevin's proposal that lessons be taught in Dutch, since engineers were hardly likely to converse in Latin, paved the way for less well-educated artisans to attend the academy. A petition submitted by students and observers shortly after its foundation shows that half were stonemasons, carpenters and bricklayers.<sup>62</sup> A year later, Frans van Schooten, who followed his father (also called Frans van Schooten) as professor at *Duytsche Mathematique* in 1645, wrote to Huygens in 1646 about the advantage of teaching mathematics in Dutch, noting that

[...] because all the crafts derive their fundamentals from this, besides the students who have attended these, all the different craftsmen also followed these lessons.<sup>63</sup>

Not everyone was happy with this development. Indeed, some frowned on the presence of craftsmen, as a description of 1660 reveals.

And in that Church where the English now preach, in this Bagijne-Hoff, public lessons are given in the Dutch language, in Mathematics, from eleven to twelve every day except Wednesdays and Saturdays, for the convenience of the unlettered, such as bricklayers, carpenters and the like; who assemble there in large numbers at this time; without jackets but carrying staffs and wearing leather aprons, etcetera; they are very comical to behold. The professor who gives the Dutch lessons also dressed in his usual distinguished professor's gown, or dress-coat, as worn by all the other Latin professors in their lessons, is the very learned and widely-renowned D. Franciscus van Schooten.<sup>64</sup>

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<sup>61</sup> J.J. Verdonk, *Petrus Ramus en de wiskunde*, (Assen 1966), pp. 351-356 and Van Berkel, *Isaac Beeckman*, p. 278.

<sup>62</sup> Molhuysen, vol. 1, p. 392. The petition is undated but was submitted somewhere between 1608 and 1611.

<sup>63</sup> J.A. Worp (ed.), *De briefwisseling van Constantijn Huygens, (1608-1687)*, vols. 1-6, (The Hague 1911-1917), vol. 4, no. 4267, pp. 278-279: 'Dewyl alle handtwerckskonsten haere fondamenten uit dese ontleenen, beneffens de studenten, die deselve hebben gefrequeenteert oock altyt van verscheyde handtwercklieden syn aenhoort worden'. See also P.J. van Winter, *Hoger beroepsonderwijs avant-la-lettre*, p. 15.

<sup>64</sup> J. de Parcival, *De Vermaeckelijckheden van Hollandt*, (Amsterdam 1661), pp. 188-189. Quoted in *Leiden universiteit 400: Stichting en eerste bloei 1575- ca. 1650*, [Rijksmuseum Amsterdam 27 March to 8 June 1975], p. 97: 'En in die Kercke, waer de Engelsche nu predicken, in dit Bagijne-Hoff, worden alle dagen,

Some feared that it would result in a lowering of standards in surveying. To ensure that these were maintained, therefore, the governors of Leiden University appointed Snellius external controller of examinations in 1602. They even tried to persuade Maurice to exert his influence with the Council of State and the States General to refuse to employ engineers who had not graduated at Leiden.<sup>65</sup> Much later, in 1645, the standard of *Duytsche Mathematique*'s examinations was again questioned. This time the cause was a personal conflict between Frans van Schooten the Younger, the new professor of mathematics on the engineering course, and Jan Jansz Stampioen, who felt he should have been offered the post. That same year, Stampioen retaliated by ensuring that no one in Holland could henceforth qualify as a surveyor without passing a personal examination by him.<sup>66</sup> Yet despite lingering doubts surrounding the standard of *Duytsche Mathematique*'s examinations, the presence of unlettered artisans was never again questioned. This was hardly surprising. Snellius, in his role as examiner, was convinced that the advantages of mathematical training for craftsmen worked both ways. He went even further than Petrus Ramus, using the practical application of crafts not simply as a means of testing theory, but as the basis for scientific development.<sup>67</sup> Jan Jansz Stampioen, whom Schooten complained had made unreasonable demands of *Duytsche Mathematique* exam candidates, was also involved from the start in the college Isaac Beekman founded with members of several occupations and trades in Rotterdam on 28 August 1626, which was intended to revitalise various crafts.<sup>68</sup> In addition to the mathematician Stampioen and physician Johannes Fornerius, the other members of Beekman's Collegium Mechanicum were the merchant Dirck Adriaensen Boefie, silk-dyer Jan Weymans, millwright Abraham Willemssen, carpenter Hygh Theunissen and a certain Mr Pieter whose original trade remains unknown. A year later, when Collegium Mechanicum was disbanded following Beekman's appointment as rector of the Latin school in Dordrecht,

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behalven 'sWoensdaeghs en Staerdaeghs van elf tot twaelf uren, openbare Lessen gedaen inde Neerlandsche Tael, in de Mathematische Konsten tot gerief van alle ongeletterden, als Metselaers, Timmer-luyden, en diergelijcke meer; die haer dan met hoopen in die tijdt hier vinden; sonder mantels, maer met hare stocken, en schootsvellen, etc. versien; dat dan seer kluchtigh om sien is. Den professor, die duytsche lessen voor haer doet, evenwel in sijnen gewoonlijcken aensienlijcken Professors-Tabbaert, ofte Rock (soo wel als alle de andere Latijnsche Professoren de hare doen), is den Hoogh-geleerden, en Wijdt-vermaerden D. Franciscus van Schooten'.

<sup>65</sup> Westra, *Nederlandse ingenieurs*, p. 88.

<sup>66</sup> For the problems surrounding the examinations of *Duytsche Mathematique*, see Van Winter, *Hoger beroepsonderwijs avant-la-lettre*, pp. 19-25.

<sup>67</sup> Van Berkel, *Isaac Beekman*, p. 278.

<sup>68</sup> K. van Berkel, 'Het Collegium Mechanicum van Isaac Beekman', in *Spiegel Historiae*, 15 (1980), pp. 336-341.

he proposed a new establishment where the lessons – in line with Stevin’s educational programme for *Duytsche Mathematique* – would be taught in Dutch ‘for the convenience of carpenters, bricklayers, skippers and other citizens’.<sup>69</sup>

Stevin now found himself associating with professors from both *Duytsche Mathematique* and Leiden University. He was both an outsider and an intermediary on the occasions that he sat on committees with Snellius, Van Ceulen and Scaliger; forming a bridge between representatives of the classical theoretical tradition and its critics, who focused on practical applications and empirical experimentation in science. Apparent scientific debates often masked underlying personal conflicts, although the interests of their establishments compelled the protagonists to overcome these differences. Yet to assess the significance of these contacts it is necessary first to examine Stevin’s own work.

### *Classicists and Modernists: Euclid and Ramus*

The perennial question of the authority of the ancient writers, an issue that had resurfaced in Europe around the mid-sixteenth century as a result not least of the far-reaching influence of Petrus Ramus’s works, reverberates throughout Simon Stevin’s writings. From his dedication in *Sterctenbouwing* to the deputy of the States General, Hendrik van Brienen, it is clear that Stevin was familiar with the discussion between the adherents of Aristotelian theory and its critics, the followers of Ramus.

You held that the Aristotelians disputed violently enough about method, but in practice used little method; that Ramus’s opinion on this matter tended to produce good results, but all the same you followed your own way. [...] that your honour called those who only study Euclidean principles, without proceeding to practice, ‘sham fighters’, who violently fight against their shadow without touching it [...] Now, although I have always been of the opinion that the theories of the theoreticians can serve to further practical work of the practicians, yet in order to prove with the documents how much your honour’s view about the combination of these two is to my liking and because I do not wish you to reckon me among the simple ‘sham-fighters’, I have sent you this actual example, which, though still they are only (as is said) castles in the air, or, even more properly expressed, bastions of paper, yet comes much nearer to the matter than theoretical ideas of magnitudes separated from matter. For since drawings and

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<sup>69</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 455: ‘Tot gerieff van timmerliën, metsers, schippers ende andere borghers’.

descriptions have to proceed the practical work, it seems that it might to some extent be called a part of the practical work.<sup>70</sup>

This passage reflects Stevin's reservations about Ramus's ideas; it shows that he did not share the latter's views about Aristotle, or about Euclid.<sup>71</sup> Stevin was first of all an Aristotelian, not a Ramist. However it also reveals the extent to which Stevin approved of the combination of theory and practice, illustrating that the emphasis placed by Ramus and his followers on the practical application and lucid presentation of theories must have appealed to the Dutch scholar's imagination. Ramus, like Stevin, was a teacher at heart, who stressed the importance of the methodical ordering of subject matter. He maintained that the truth of a theory should be demonstrated by a certain arrangement of arguments and sub-arguments, which he called the natural sequence. Thus the correct classification was neither arbitrary nor subject to change; there could be only one correct method, namely the natural method, following a natural hierarchy of arguments and sub-arguments. Ramus and his adherents also emphasised the visual presentation of logic. Van Berkel, from whom this information about the French mathematician's ideas are drawn, referred in

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<sup>70</sup> S. Stevin, *Sterctenbouwing*, [Leiden 1594; pp. 2-4], in *The Principal Works of Simon Stevin*, vol. IV, pp. 43-47: 'V.E. hieldet daer voor, dat de Aristotelischen bestelick ghenough vande Oirden [methode] strecken, maer metter daet weynich Oirdens ghebruyckten: Dat Ramus meining van dies tot een goet einde streckte doch volghdet ghy noch dijn eyghen sin [...] dat V.E. den ghenen die hun niet dan in Euclidische beghinselen en oeffenen, sonder tot de daet te comen, Spieghelvechters noemde, die haer schaduwe heftelick bestrijden sonder gheraken [...] Nu hoewel mijn meyning altijt was, dat der Spieghelaers spieghelingen, tot voordering van der doenders daden connen strecken: Nochtans om mette Sticke te bewijzen, hoe my de vermenghinghe deser twee bevalt, ende dat ick niet en begheer datse my onder de eenvoudighe Spieghelvechters reket, soo heb ick haer dit werckelic voorbeelt toegeschickt: Het welcke, hoewel dattet noch al maer (ghelijck men segt) Burghen inde locht, ofte noche eyghentlicker, papiere bolwercken sijn. Doch commet de sake veel naerder, dan Spieghelsche ghedachten der grootheden ghescheyden van stof; want anghesien teyckeningen ende redenen der omstandighen, voor het dadelick werk moeten gaen, soo schynet datment eenichsins deel des dadelick wercx soude meughen noemen'.

<sup>71</sup> Later, Stevin emphasises that 'int bescrijven van dien, gheen Oirden uijt halving des heels in delen en volgen' (It is also to be understood that in doing so I follow no method of halving the whole into parts) – Stevin's own system of dichotomies. Instead, following Euclid's example, Stevin first explained all the concepts; this was then followed by a description of the fortress according to the Vitruvian layout in plan, elevation and perspective. Although Stevin does not seem to completely reject Aristotle's order in his preface to *Sterctenbouwing*, he and Jan Cornets de Groot together carried out an experiment in the Grote Kerk in Delft which turned out to be a 'proof against Aristotle': they dropped two lead balls – one ten times larger than the other – simultaneously from the same height and observed that they hit the ground at the same time. This experiment preceded Galileo's legendary experiment at the Tower of Pisa by twenty years. See Stevin, *Sterctenbouwing* [p. 8], in *The Principal Works of Simon Stevin*, vol. IV, p. 67.

this connection to the ‘clearly visualised thought of Petrus Ramus’.<sup>72</sup> While the mathematician J.J. Verdonk noted the influence that Ramus’s ideas exerted on Stevin, he was referring principally to *Dialectike ofte Becoyconst* and Stevin’s mathematical works. Here it is the significance of Ramism on Stevin’s *Huysbou* that is of interest.<sup>73</sup>

### *Stevin and the Age of Sages*

In several of his works, including *Huysbou*, Stevin referred to a supposedly crucial, though obscure period in science, the ‘Wysentijd’ or ‘Age of Sages’. This mythical golden age was traditionally held to have preceded Graeco-Roman civilisation before lapsing into decline. Fortunately, however, traces of this age had remained. A few Greek and Roman scholars had managed to incorporate the remains of knowledge from the Age of Sages in their writings. Following a discussion with Stevin, Hugo de Groot noted a list of these which appeared in ‘Eertclootschrift’, in *Wisconstighe Ghedachtenissen*.<sup>74</sup> He also commented on the essay ‘Vande vernieuwing des wysentijts, t’welck is verclaring hoet schijnt datmen de saeck mocht anlegghen, om allencx weerom te gheraken an sulcke groote wetenschappen alsser in de Wysentijt geweest sijn’ (‘On the revival of the Age of Sages which explains how one might apply the principles so that everyone might come to understand these great sciences, as they were in the Age of Sages’).<sup>75</sup>

In his dedication to *Sterctenbouwing*, Stevin confined his comments to a few observations about the authority of classical authors and the criticisms of the Ramists. But in his exposition of the revival of the Age of Sages he offered a closer analysis of these methodological questions. To revive this ancient ideal Stevin considered it essential that science satisfy four related conditions. First, as many people as possible had to be involved if science were to be substantiated

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<sup>72</sup> ‘[...] aanschouwelijk denken van Petrus Ramus’. For his critique on Euclid, see Van Berkel, *Isaac Beekman*, p. 261.

<sup>73</sup> For the relationship between Stevin and Ramus, particularly with regard to mathematical methods, see J.J. Verdonk, ‘Vom Einfluß des P. de la Ramée auf Simon Stevin’, in *Centaurus*, vol. 13, no. 3/4 (1969), pp. 251-262. For the relationship between Stevin’s architectural theory and Ramus, see C. van den Heuvel, ‘Stevin et Ramus: Méthodes d’architecture militaire et civile en bois’, *Actes du Colloque Internationale sur les Plans-Reliefs au Passé et au Présent [23, 24, 25 April 1990 in the Hôtel National des Invalides, Symposium chaired by Professeur André Corvisier]*, (Paris 1993), pp. 57-70; adapted Dutch translation, idem, ‘Stevin en Ramus: Architectuurmodellen en voorstellingen van logische orde’, in *Feit en Fictie*, vol. 11, (Autumn 1994) 1, pp. 95-111; see also idem, *Papiere Bolwerken*, pp. 146-147.

<sup>74</sup> S. Stevin, *Wisconstighe Ghedachtenissen*, ‘I Bouck des Eertclootschrifts’, p. 16. See also Eyffinger, *The Poetry of Hugo Grotius*, p. 128-130.

<sup>75</sup> S. Stevin, *Wisconstighe Ghedachtenissen*, ‘I Bouck des Eertclootschrifts’, p. 17.

by practical observation. To achieve this broad involvement, scientific experiments and proofs had to be presented in the vernacular. Thus the qualities of the language itself had to be examined and then an appropriate system had to be devised to develop the correct order for describing and conveying this branch of knowledge. Moreover, Stevin believed that the foundation had to be derived from the Age of Sages, especially in the case of mathematics.

These conditions for a revival of the Age of Sages relate to the contemporary debate on the validity of classical methods and were echoed in various passages in *Huysbou*.

To demonstrate the need for empirical evidence when searching for logical conclusions, Stevin gave the example of thriving towns built on river banks, whose populations grew as a result of their location, a subject he had addressed in 'Vande oirdeningh der steden'. Stevin argued against Aristotle's preference for medium-sized towns in his discourse 'Vande middelen daermen groote machtighe Steden deur maken can' ('On the means by which large and powerful cities can be created'). In his impassioned defence of large population centres, Stevin maintained that cities were places in which people could learn about what was happening in the world and that their universities were not just useful for the education of children, they also brought scholars together.<sup>76</sup> In short, the size of a town determined its standard of knowledge and education.

To show the importance of correct terminology and the need to study language, Stevin cited an example from music theory in 'Vande vernieuwing des wysentijts', which bore directly on architectural theory. He described how a certain misconception in music theory, whereby perfect sounds are held to be imperfect, can largely be explained by the fact that 'people use an unsuitable terminology of art: for example, instead of employing the indigenous word *everedenheyt*, the foreign word *Proportie* [proportion] is used'.<sup>77</sup> Stevin returned to similar aspects of music theory in his *Huysbou* when addressing the natural laws of mirror symmetry and explaining how misconceptions in architectural theory resulted from the corrupt use of words borrowed from other languages.

Finally, various connections also appear to exist between the system which Stevin claimed had enabled the sciences to attain their highest level in the Age of Sages and the theoretical foundations of the method outlined in *Huysbou*.

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<sup>76</sup> S. Stevin, *Huysbou*, [VIII-1], p. 348. Cf. H. Stevin, 'I Onderscheyt van de Oirdeningh der Steden', in *Materiae Politicae: Burgerlicke Stoffen*, (Leiden 1649) p. 8.

<sup>77</sup> S. Stevin, *Wiskonstige Gbedachtenissen*, 'I Bouck des Eertclootschrifts', p. 22: '[...] menschen onbequamen constwoorden gebruycken: Als datmen by ons in plaets vant inlandich woort everedenheyt, genomen heeft het uytheemse Proportie'.



Stevin arranged the sciences according to five themes: components of a mathematical proposition, definitions, dichotomies, anaphora and the combination of theory and practice.<sup>78</sup> Interestingly, Stevin used architectural observations to illustrate several of these themes.

### *Definitions*

In his exposition of his second theme, that of definitions or *bepalinghen*, Stevin explained, following Euclid, that before dealing with a subject it was necessary to first define *der eyghen constwoorden*, the proper terminology.

At times I needed to know more about earthworks, mat works, carpentry, bricklaying, smithing (and similar subjects to be discussed in Huysbou in greater detail) than I was able to find out from books or mathematicians: here the workmen provided [me with] the best teachers, each in their own field: [but] to make good headway in my investigation, I followed the method used in the Age of Sages, enquiring among excavators about earthworks, among matters about osier work, among carpenters about carpentry and so forth, concerning the meaning of the particular terms that I required and did not understand, which, having collated the definitions and learned these by heart, I was able to use in conversation with them so that they understood me and I they, as if I had long been acquainted with their craft, acquiring with ease in a moment the knowledge of that which would otherwise have taken much longer: so, just as it advisable to collate and learn the definitions before approaching subjects in the field of mechanics the same is true of the liberal arts.<sup>79</sup>

Although Stevin was referring here to Euclid's classification of materials, this discussion also reveals a typical Ramist touch, that craftsmen could supply

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<sup>78</sup> S. Stevin, *Wisconstighe Gbedachtenissen*, 'I Bouck des Eertclootschrifts', p. 41: 'Leden van een Wisconstich voorstels', 'bepalinghen', 'tweescheyding', 'selfwoordicheyt' and 'vant menghen der spiegeling en daet'.

<sup>79</sup> S. Stevin, *Wisconstighe Gbedachtenissen*, 'I Bouck des Eertclootschrifts', p. 43: 'Tis ghebeurt dat ick van eerdewercken, rijswercken, timmering, metsing, smeding (en dierghelijcke daer inden Huysbou breeder afgheseyt sal worden) meer behoufde te weten dan ick deur boucken of Wisconstenaers leeren conde: Hier toe verstrecken my de wercklyuden elck in haer const voor beste meesters: Maer om in mijn leering goede voortganck te krijghen, ick volghde Wysentijt oirden, vraghende voor al den Eerdewerckers in eerdewercken, Rijstwerckers in rijswercken, Timmerlien in timmering&c. na de beteyckening van haer eygen woorden die ick my noodich bevant,, en niet en verstont, welke ick als bepalinghen oirdentlick opgheteyckent hebbende, en die van buyten gheleert, ick spraeck terstont met hun soo datse my verstonden, en ick hemlien, al hadde ick lange tijt met die handtwerckenomghegaen, gherocht alsoo met lichticheyt tot kennis van t'ghene anders veel langer tijt soude behouft hebben: Nu ghelijck dit versamen en leeren der bepalinghen eermen ande saeck comt, oirboir is in tuychwerckelicke consten\* [mechanicus artibus] alsoo ist oock inde vrije\* [Liberalibus Theoriae]'.

knowledge omitted in theoretical treatises. This attempt to combine the characteristics of classical methods – especially Euclid’s – with those of the Ramists recurs in Stevin’s exposition of the scientific system of the Age of Sages, ‘Van de tweescheyding’ (‘On dichotomies’).

### *Dichotomies*

Ramus, and more especially his followers, analysed and visualised logic in terms of dichotomies. Each concept was systematically broken down into pairs of symmetrical sub-concepts, each of these being subdivided into further pairs until every aspect of the original concept could be explained as part a transparent system. Stevin recognised the advantages of this lucid method of presentation and noted that dichotomies had also been employed in the Age of Sages. Although Plato and Aristotle had not presented their arguments in this way, Stevin maintained that they had discussed the method and that it could be clearly observed in Euclid.<sup>80</sup> This attempt to relate classical methods to those of the Ramists reflects Stevin’s wish to reconcile the two and to avoid a conflict.<sup>81</sup> As his prefaces to other works show, he constantly oscillated between blind faith in his heroes of the past and acceptance of the challenge implicit in the analyses of those who disputed the authority of the classical authors. In *L’Arithmétique*, the French edition of his work on arithmetic, Stevin began by setting out the terms of the book in a series of dichotomies,<sup>82</sup> stating that

‘[...] were such an account to be rewritten, for the different forms of each of the sections or books, I would create separate definitions for each one, as Euclid did, and as has been done in these *Wisconstighe Ghedachtenissen*, in which the dichotomy can still be followed.’<sup>83</sup>

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<sup>80</sup> S. Stevin, *Wisconstighe Ghedachtenissen*, ‘I Bouck des Eertclootschrifts’, p. 44: ‘[...] opentlick be-merckt’.

<sup>81</sup> Cf. S. Stevin’s observation in *Wisconstighe Ghedachtenissen*, ‘I Bouck des Eertclootschrifts’, p. 45: ‘Ten anderen en wil ick noch bevestigen noch ontkennen Euclides self een ervaren tweescheyder gheweest te sijn, maer wil ick segghen in sijn boucken seer merckelick teycken der tweescheyding te blicken, ghelijck men benevens t’ghene voorseyt is nauwer soude connen bewijzen, wierdet om de cortheyt niet ghelaten’.

<sup>82</sup> S. Stevin, *Wisconstighe Ghedachtenissen*, ‘I Bouck des Eertclootschrifts’, p. 43: ‘[...] ‘Merckt noch dat ick in mijn Telkonst in Francois beschreven, [...] alsoo den heelen handel in oirden der tweescheyding te vervangen’.

<sup>83</sup> S. Stevin, *Wisconstighe Ghedachtenissen*, ‘I Bouck des Eertclootschrift’, p. 43: ‘[...] aldien sulcke beschrijving noch eens te doen waer, ick soude voor elck der deelen of boucken van verscheyden gedaenten wesende, sijn eyghen bepalinghen stellen, gelijk Euclides dede, en soo in dese Wisconstighe Ghedachtenissen ghedaen wort, want de tweescheyding alsoo ewel can ghevolght worden’.

Although Stevin did not directly refer to *Huysbou* in his discourse on dichotomies, he did mention aspects relevant to his architectural theory.<sup>84</sup> Thus the observation that dichotomy is a useful system because ‘it enables one to describe all the parts of a whole, or the origins of a family with great accuracy’ is also cited in Stevin’s discourse on the natural origin of columns,<sup>85</sup> while the use of dichotomies is reflected in the importance of mirror symmetry in the design of Stevin’s architecture.

Finally, the concluding methodological section on the merging of theory and practice – ‘Vant menghen der spiegeling en daet’ – contains references to both the discussion advanced by the Ramists and Stevin’s views on architecture.

### *Theory and practice*

It is clear that Rudolf Snellius believed in the importance of crafts for the improvement of science and that this was what prompted Isaac Beeckman to found Collegium Mechanicum, where lettered and unschooled craftsmen and merchants could study science and engineering. Only a year after its foundation, however, Beeckman expressed his doubts about the school’s method:

While people were discussing various issues I thought to myself, we are talking about mills but we have no practical experience in this matter; how can we possibly contribute effectively to this area unless we know everything there is to know about it as do the millers, which is impossible, unless we actively take up this work and do it without complaining for many years? And if we then want to help first the smiths, the carpenters, the bricklayers, and so on, the work will be endless and we will not be able to do it satisfactorily.<sup>86</sup>

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<sup>84</sup> It is not known for certain whether Stevin intended to preface his *Huysbou* with a presentation of dichotomies. The running text, however, does contain indications of such a structure. For example, in his treatment of courtyards for providing light Stevin makes a point of stating that he will first discuss the subject of light in entire rooms and then in parts of rooms. Also Stevin discusses both ‘ornamented’ and ‘unornamented’ façades, as well as dividing the architectural orders into ‘pylaren tot gerief’, columns for convenience and others ‘tot cieraet’, for decoration. There are several German seventeenth-century architectural treatises which show the various different subjects organised in dichotomies that were either written by authors who came from the Republic or who had studied in Leiden. See, for example, the works of N. Goldmann and L.C. Sturm. See J. Goudeau, ‘Nicolaus Goldmann (1611-1665) en de praktijk van de studeerkamer’, in *Bulletin van de Koninklijke Nederlandse Ondbeidkundige Bond*, (1995/6), pp. 185-203. J. Gondeau, Nicolaus Goldmann (1611-1665). Architectuurtheorie in een wiskundige wereld [Utrecht University PhD] 2005.

<sup>85</sup> S. Stevin, *Wisonstighhe Ghedachtenissen*, ‘I Bouck des Eertclootschrift’, p. 44: ‘[...] men daer deur met groote sekerheyt can treffen al de deelen eens heels, of afcomsten eens gheslachts dieder te beschrijven sijn’.

<sup>86</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 455: ‘Terwylen men van d’een ende andersake sprack, dacht ick by my selven: Wy spreken nu van molens, daer wy niet in geoeffent en syn; hoe ist

His doubts concerned the time-consuming nature of the exercise rather than the value of the contribution of craftsmen. Beeckman apparently thought it impossible for a person to contribute without having had practical experience in the profession or craft. Stevin, on the other hand, held a less extreme position, midway between the representatives of classical antiquity, such as his hero Euclid, and their Ramist critics.

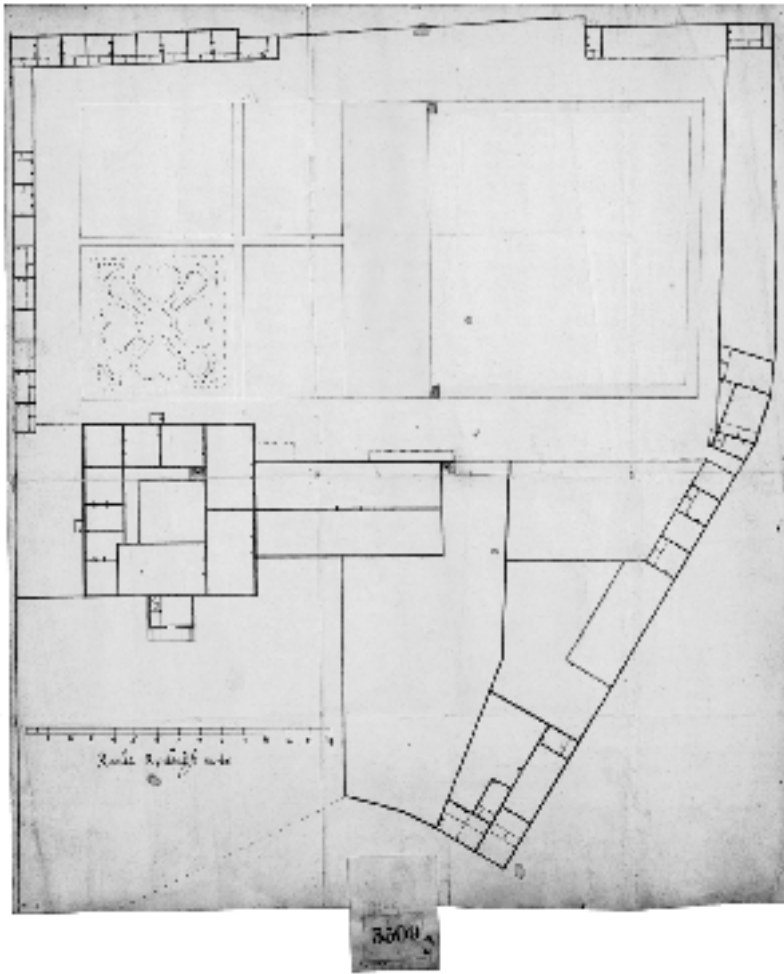
With regard to the many statements that theory without practice is useless, it seems that one should view the matter with greater discrimination. To state my own point of view, I would say: although some people may think that the work of labourers who saw down trees in the wood is of no value, because they themselves do not build houses, mills, sluices, barrels, chests, sculptures and such like [...], their work is not to be scorned [...] this also applies to the theorists in the applied arts, they can produce matter for the practitioners and be of use without being practitioners themselves: As the theorist Euclid, who we do not find to have been a practitioner, nevertheless described proposals which have clearly been useful to actual architects and land surveyors and other practitioners [...] Thus a theorist's theories which also serve the practitioners are useful even though he is not a practitioner.<sup>87</sup>

Although Stevin attached great importance to the practical application of science, he evidently thought it unnecessary for the student to be personally engaged in the practice. It is worth noting that in this discourse on theory and practice Stevin used the metaphor of building.

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ons mogelyck daer yet goets in te doen, tensy dat wy alles datter op loopt soo wel weten als de molenaers, twelck onmogelyk is, tensy dat wy dat werck alleen by de handt nemen ende jaren daerover sonder verdriet arbeyden? Want willen wy dan de smits, dan de timmerlieden, dan de metsers etc. helpen tis werck sonder eynde ende wy connen niet perfect doen'.

<sup>87</sup> S. Stevin, *Wisconstige Gbedachtenissen*, 'I Bouck des Eertclootschrift', p. 47: 'Angaende ettelicke segghen de Spiegeling sonder daet onnut te wesen, het schint datmen de saeck met beter onderscheyt soude meughen insien. Om hier af mijn ghevoel te verclaren, ick segh by voorbeelt aldus: Daer men t'werck eens arbeyders die boomen int bosch afhout, soude voor onnut achten, om dat hyder self gheen huysen, schepen, molens, sluysen, tonnen, kisten, beelden en dierghelijcke me en maeckt [...], soo en is sijn arbeyt niet te verachten [...] en alsoo ist ook mette Spiegelaers in de vrye consten, sy connen den Doenders stof leveren en voorderlick sijn sonder self Doenders te wesen: Als den Spiegelaer Euclides, die wy nieten bevinden Doender gheweest te hebben, heeft nochtans voorstellen beschreven den dadelicken Boumeesters en Landmeters, en ander doenders seer voordelick [...] Daerom een Spiegelaers Spiegelinghen die anders Doenders te sta commen, en sijn niet onnut al en is hy gheen Doender'. For the same argument, see also H. Stevin, 'II Onderscheyt van het Burgerlick Leven Anhangh Simon Stevin tot de leser', in *Materiae Politicae: Burgerlicke Stoffen*, (Leiden 1649), pp. 34-35.



Ill. 3 Design for refurbishment of Prinsenhuis and formal garden from Simon Stevin 1617 – The Hague, Nationaal Archief, VTH 3509

### *Stevin as architect*

While Stevin referred repeatedly to military architecture in his mathematical texts he rarely discussed civil architecture. Most authors of treatises on architecture in this period were actually engaged in either designing or depicting architecture; they were either architects or painters. Stevin drew designs of fortifications and civil engineering works. He also drew preliminary sketches for the layout of military camps, as well as schematic but clear illustrations for scientific treatises. However, he was not a professional architectural

draughtsman. Indeed, contrary to what has once been asserted, it is unlikely that Stevin was a painter either.<sup>88</sup> All that is known about his activities in the field of architecture is that in 1617 he acted as Maurice's advisor for the refurbishment of Prinsenhuis at Flushing and the design of its formal gardens (ill. 3).<sup>89</sup> No information exists about Stevin's earlier architectural activities and he certainly did not write his *Huysbou* as an architect. This is clear from the example that Stevin gave to illustrate his own ideas about theory and practice.

It is true that knowledge of both would be extremely advantageous, as, for example, would the renowned Architect Vitruvius not have been better had he been a master at bricklaying, carpentry, cabinetmaking, spinning, plastering, stonemasonry, sculpting, painting, glass engraving and other such crafts for which he set down rules, but for which he said that his life was too short, also that a person can derive satisfaction from all these things and in this way one must not seek to confine anyone impossibly: therefore theorists inexperienced in the practice such as Ptolemy, Euclid, Vitruvius and their followers so long as they remained within the bounds of theory, they are thus faultless in the practice of their profession.<sup>90</sup>

Stevin had the same ideal in mind and conveniently forgot that Vitruvius was traditionally thought to have been the architect of the basilica at Fano. When he listed the crafts for which Vitruvius's *De Architectura Libri Decem* might prove

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<sup>88</sup> Chr. J. Kolman, *Naer de eisch van 't werck: De organisatie van het bouwen te Kampen 1450-1650*, (Utrecht 1993), p. 305, quotes a document which mentions the fact that after revising a drawing Maurice ordered 'Symen schilder' [Simon the painter] to make a new plan from his drawing and design. Nevertheless it seems to me that, if for no other reason, Stevin's critical statements about this profession would preclude his being designated a painter. Moreover, in his profession as engineer Stevin would be more likely to make the designs than the presentation drawings.

<sup>89</sup> F. Vermeulen, 'Simon Stevin Bouwmeester van het Prinsenhuis te Vlissingen', *Oudheidkundig Jaarboek*, 4th series, vol. 5, (1936), pp. 43-47 and J. den Hoed, 'Het Prinsenhuis te Vlissingen', *Bulletin van de Koninklijke Nederlandse Oudheidkundige Bond*, 6th series, vol. 15, (1962), no. 5, pp. 336-346. Vermeulen refers to Stevin as both the designer and the refurbisher of the Prinsenhuis; Den Hoed correctly states that he was the latter. For a more recent publication on Stevin as architect for Maurice of Nassau, see A. de Vos, 'Bouwen voor nut en vermaak', in K. Zandvliet (ed.), *Maurits, Prins van Oranje*, Rijksmuseum exhib. cat. (Amsterdam/Zwolle 2000), pp. 123-137.

<sup>90</sup> H. Stevin, 'Onderscheyt van het Burgerlick Leven', pp. 34-35: "t Is wel waer dat wetenschap van beyden tot de sake seer vordelick soude zijn, als by gelijkenis, ten hadde den vermaerden Boumeester Vitruvius daen niet beter geweest, dat hy metter hant hadde connen meesterlick metsen, timmeren, schtijnwercken, draeyen, plaesteren, steenhouwen, beeldt-snijen, schilderen, glaseschrijven, ende diergelicke ambachten meer, daer hy regelen voor geschreven heeft, maer gemerckt sijn leven daer toe te cort was, oock dat van alle dese dinghen, den mensch genouch can te doen geven, soo en moetmen niemant onmeughelick willen verbinden: Daerom wanneer de Spiegheelaers onervaren inde daet gelijc Ptolemaeus, Euclides, Vitruvius en haers gelijk waren, binnen de palen der Spiegeling blijven, so oeffenen sy hun onberispelick in haer berouf'.

useful, Stevin was apparently referring directly to the title pages of the earliest Dutch excerpts from works by the architects of antiquity and the Italian Renaissance.

### *Stevin and Vitruvianism in the Low Countries*

Following the discovery by Poggio Bracciolini and Cenzio Rustici of the manuscript of *De Architectura Libri Decem* in the library of St Gallen in 1415, the works of Vitruvius were extensively annotated by Italian humanists and architects. This revival of interest in Vitruvius, whose work had been copied regularly in the Middle Ages, led to a wide circulation of annotated texts and translations, especially after the development of printing in the second half of the fifteenth century. The texts were translated and augmented with illustrations and contemporary discourses in a flood of commentaries and often distorted reinterpretations known within the wider term 'Vitruvianism'.

A tradition of publishing architectural treatises in the Dutch language already existed when Stevin first broached the idea of his *Huyshbou*. But unlike other European countries, such as France and Germany, where complete translations of Vitruvius and his Italian commentators had already been published in the sixteenth century, only a few fragments had been printed in the Low Countries. The year 1539 saw the publication of *Die Inventie Der Columnen* and *Generale Reglen der Architecture* – two extracts from Vitruvius and Serlio respectively.<sup>91</sup> In these volumes, Pieter Coecke van Aelst focused on passages describing the architectural orders, although he and subsequently his widow Mayken Verhulst were to supplement the Serlio translation with further editions, designed to provide a complete survey of classical and Italian architectural theory. A third work – *Architectura* by Hans Vredeman de Vries – did include brief references to other architectural matters, such as military and civil engineering, but the classical orders remained central.<sup>92</sup> Essentially different

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<sup>91</sup> R. Rolf, *Pieter Coecke van Aelst en zijn architectuuruitgaven van 1539: Met reprint van zijn 'Die inventie der colommen' en 'Generale Reglen der Architecture'*, (Amsterdam 1978). A. Bodar, 'Vitruvius in de Nederlanden', [Bouwen in Nederland, Vijfentwintig opstellen over nederlandse architectuur opgedragen aan Prof. Ir. J.J. Terwen], *Leids Kunsthistorisch Jaarboek*, (1984), pp. 55-104. and K. de Jonge, 'Vitruvius, Alberti and Serlio: Architectural treatises in the Low Countries, 1530-1620', in *Paper Palaces: The Rise of the Renaissance Architectural Treatise* [edited by V. Hart with Peter Hicks], (New Haven/London 1998), pp. 281-296 and idem, 'Les éditions des Livres I B V de Serlio par Pieter Coecke van Aelst', introduction to S. Deswarte (ed.), *Sebastiano Serlio à Lyon*, (Lyon 1999).

<sup>92</sup> H. Vredeman de Vries, *Architectura oder Bauung der Antiquen*, ([Antwerp 1581] facs. Hildesheim/New York 1973); p. 4, for example, shows a sort of form for a bridge pier as well as a technical invention for a bridge which could accommodate a high-masted vessel without its having to be opened. It is worth noting Vredeman de Vries's justification for the scant attention he pays to military architecture

from these printed works, however, is the tradition and reception of Vitruvius and his commentators in sixteenth-century Dutch manuscript sources.

An often-quoted affidavit, recorded in Antwerp in connection with a lawsuit in Utrecht of 1542 concerning a breach of the regulations of the stonemasons guild, includes a report with a highly interpretive review of statements on the profession of architect in the first book of Vitruvius and the prologue to Alberti's *De Re Aedificatoria*.<sup>93</sup> Forgotten until recently is the Bruges stonemason Charles De Beste's bulky manuscript 'Architectura' of 1599, which consists of eight books and is housed in the Royal Library in Brussels.<sup>94</sup> This work presents various themes from Vitruvius's *De Architectura*, such as essays on astronomical instruments and sundials, perspective, fortifications and artillery. In the fifth book, De Beste combined a treatment of the architectural orders, including substantial references to Serlio, Coecke van Aelst and Vredeman de Vries, with discourses on some of the technical aspects of building, such as the supply and preliminary treatment of materials, the laying of foundations,

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– namely that he had already addressed this subject in a discussion on fortification construction. On this subject, see also C. van den Heuvel, 'Stevens "Huysbou" en het onvoltooide Nederlandse architectuurtractaat: De praktijk van het bouwen als wetenschap', in *Bulletin van de Koninklijke Nederlandse Oudheidkundige Bond*, vol. 93, (1994), no. 1, pp. 1-18. On the architectural theory of Hans Vredeman de Vries, see P.S. Zimmermann, 'Die Palastentwürfe des Hans Vredeman de Vries in der Architectura von 1577', in G. Bers and C. Doose (eds) *'Italienische' Renaissancebaukunst an Schelde, Maas und Niederrhein: Stadtanlagen-Zivilbauten-Webranlagen. II. Jülicher Pasqualini-Symposium vom 18. bis 21. Juni 1998 in Jülich. Tagungshandbuch 1999*, (Jülich 1999), pp. 335-361 and P.S. Zimmermann, *Die Architectura von Hans Vredeman de Vries. Entwicklung der Renaissancearchitektur in Mitteleuropa*, München/Berlin, 2002

<sup>93</sup> S. Muller Fz, 'Getuigenverhoor te Antwerpen over het maken van ontwerpen van gebouwen in de 16<sup>de</sup> Eeuw' in *Obreen: Archief voor Nederlandsche Kunstgeschiedenis*, vol. IV (1881-1882; reprinted Soest 1976), pp. 227-245, esp. 243-245. H. de la Fontaine Verwey, 'Pieter Coecke van Aelst en zijn boeken over architectuur', *Uit de wereld van het boek*, vol. 1, 'Humanisten, dwepers en rebellen in de zestiende eeuw', (Amsterdam 1976; 2nd edition), pp. 51-68, R. Meischke, 'Het architectonische ontwerp in de Nederlanden gedurende de late middeleeuwen en de zestiende eeuw', *Bulletin van de Koninklijke Nederlandse Oudheidkundige Bond*, 6th series, vol. 5 (1952), col. 161-230. H. Miedema, 'Over de waardering van architect en beeldende kunstenaar in de zestiende eeuw', *Oud Holland*, vol. 94, (1980), pp. 71-87 and idem, *Kunsthistorisch, Maarssen* (1989), pp. 192-193. J. Offerhaus, 'Pieter Coecke et l'introduction des traités d'architecture aux Pays-Bas', in *Les traités d'architecture de la Renaissance, [Actes du colloque tenu à Tours du 1<sup>er</sup> au 11 juillet 1981]*, (Paris 1988), pp. 443-451; Van den Heuvel, *Papiere Bolwerken*, pp. 46-48; W. Kuyper, *The Triumphant Entry of Renaissance Architecture into the Netherlands: The Joyeuse Entrée of Philip of Spain into Antwerp in 1549, Renaissance and Mannerist Architecture in the Low Countries from 1530 to 1630*, (Alphen aan den Rijn 1994), pp. 305-311.

<sup>94</sup> C. van den Heuvel, 'De Architectura (1599) van Charles De Beste: Een onbekend architectuurtractaat van een Brugse bouwmeester', in *Handelingen van het Genootschap voor Geschiedenis*, vol. 131, (1994) nos. 1-3, pp. 65-93 and idem, 'De Architectura (1599) van Charles De Beste: Het vitruvianisme in de Nederlanden in de zestiende eeuw', *Bulletin van de Koninklijke Nederlandse Oudheidkundige Bond*, (1995) no. 1, pp. 11-23.



bricklaying methods and roofing.<sup>95</sup> These manuscripts show that the interest in the Low Countries for Vitruvius's *De Architectura* was wider in scope than might be presumed from the printed extracts.

Stevin's *Huysbou* was both a reaction to Coecke van Aelst and Vredeman de Vries's discussions on columns and a supplement to the supposedly forgotten knowledge of Vitruvius and his commentators, which had largely been omitted from the first printed Dutch architectural treatises. Stevin was the first theorist not to attempt a reconstruction of the proportions of classical columns, dealing instead with the fundamental premises of the origin and logic of Vitruvian theory. While the choice of subject and the beautiful prints of Coecke and Vredeman de Vries's books reveal a bias towards the aesthetic aspects of architecture, the substance of Stevin's work reflects his focus on constructional aspects.<sup>96</sup> Without explicitly using these terms, Stevin provided a highly individual interpretation of the characteristic Vitruvian balance between *firmitas*, *utilitas* and *venustas*. Interestingly, Stevin made particular reference to Vitruvius and his followers in the chapters devoted to the structural and material aspects of buildings and the use of architecture. For example, he cited Alberti when discussing chimney pots and forms of roofing, and Serlio on materials for window shutters. In his description of well drilling in Amsterdam, Stevin referred not only to the work of Pliny and Palladius but also to Vitruvius's chapter on water. Moreover, his study of the practical layout of the private house was based on that of Graeco-Roman houses as described by Vitruvius and his commentators.

Yet although he sought to correct and complement existing architectural knowledge, Stevin was mainly concerned in *Huysbou* with presenting a model that would bridge the gap between ancient and the modern times and so obtain again the standards achieved in the Age of Sages. It is therefore precisely from this combination of a critical attitude toward Vitruvianism in the narrow sense and a more general view of scientific methods that Stevin's discourse on architecture and town planning should be approached.

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<sup>95</sup> Van den Heuvel, 'De Architectura: Het vitruvianisme in de Nederlanden', pp. 11-13, and idem, 'De Architectura: Een onbekend architectuurtractaat', pp. 65-93.

<sup>96</sup> In this connection it is worth mentioning that while Stevin developed his treatment on symmetry (which in any case he did not see as simply a matter of aesthetics) in a separate chapter, he only summarised the theories on the architectural orders, which were central in other Dutch publications, in a number of discussion points at the end of his *Huysbou*. S. Stevin, *Huysbou*, 'Aenteijckeningen op Serlijns en anderen/Inhoudende sommige geschillen'.

## 2. Stevin's ideas about symmetry and order

*Just as nature or the Creator of animals produces like-sidedness, so the architect should emulate this and design buildings with like-sidedness.*<sup>97</sup>

While many fifteenth-century and later commentators and critics wrestled with the essential meanings of terms used by Vitruvius to describe the qualitative aspects of ancient Greek buildings, Stevin preferred to focus on a single term: symmetry.

Stevin maintained that the Greek term symmetry, which he translated literally as *saemmaticheyt*, or the quality of having the same dimensions, had been erroneously interpreted by Vitruvius and his followers as the ratio of the parts to the whole – analogous to the relative proportions of the head, nose, feet and other parts of the ideal human figure. This is the key to understanding why Stevin preferred the term *lycksijdicheyt* – his neologism for the modern term ‘mirror symmetry’, literally ‘like-sidedness’ – which he defined as

[...] the agreement of the right and left parts of a body in shape, size and appearance.<sup>98</sup>

Stevin argued that if the term *lycksijdicheyt* had been used in antiquity instead of *saemmaticheyt*, such a misunderstanding in architecture would never have arisen, noting that long before Vitruvius, the architects of antiquity had declared that

[...] a building should be like an animal, and if one wishes to make it correctly, one should follow nature. By which it should be understood that just as nature or the Creator of animals produces like-sidedness, so the architect should emulate this and design buildings with like-sidedness.<sup>99</sup>

Mirror symmetry therefore had its origins in nature and should, in Stevin's view, serve as the basis for logical architecture, unlike the proportional symmetry of Vitruvius and his followers. Since there is no proportional relationship

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<sup>97</sup> S. Stevin, *Huyssbou*, [I-1], p. 209. Cf. H. Stevin, ‘Onderscheyt van de Oirdeningh der Steden’, p. 13.

<sup>98</sup> S. Stevin, *Huyssbou*, [I-1], p. 207. Cf. H. Stevin, ‘Onderscheyt van de Oirdeningh der Steden’, p. 12.

<sup>99</sup> S. Stevin, *Huyssbou*, [I-1], p. 209. Cf. H. Stevin, ‘Onderscheyt van de Oirdeningh der Steden’, p. 13.

between the parts of human and animal bodies there could be no question, in this instance, of a consistent natural order of the parts to the whole serving as a basis for architecture.<sup>100</sup> This approach had far-reaching consequences for the view – generally accepted since Vitruvius – that the fixed proportions of classical columns originated in nature and reflected a universal ideal of beauty. In fact, Stevin took distance from the concepts that had shaped architectural theory up to that time.

### *Stevin and the classical orders*

Vitruvius illustrated his idea that the proportions of columns originated in nature and therefore corresponded to a universal, divine beauty with an analogy to the proportions of the ideal human figure.<sup>101</sup> He demonstrated the harmony of the dimensions of the Doric order by relating these to the dimensions of the male figure, the Ionic to those of the female and the Corinthian to those of a young girl. This harmony of elements in the architectural orders and the parts of the human figure was illustrated in the many printed works that began to appear in the Renaissance. In the fourth book of his *I Libri dell'Architettura* (1537) Serlio supplemented the original three orders with illustrations of the Tuscan and Composite orders, after which the arrangement into five orders became standard. In the course of the sixteenth century, however, as the emphasis came to rest on the illustrations, the analogy between the human figure and architectural forms began to take on a life of its own. The illustrations in the different architectural treatises, however disparate, were not always accompanied by explanatory texts. And where some form of discussion was presented, it was limited to exploring how far the human figure could be further subdivided and which parts of a building corresponded to these categories. Stevin considered this discussion largely irrelevant, referring those interested in this aspect to Daniele Barbaro's commentaries on Vitruvius in which these anthropomorphic comparisons were carried to the extreme.<sup>102</sup> He did not include any measurements of columns and nothing ever came of his proposal to place those of Vitruvius, Alberti and Serlio side by side 'to satisfy the curiosity of those who wish to know'.<sup>103</sup>

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<sup>100</sup> S. Stevin, *Huysbou*, [I-1], p. 211. Cf. H. Stevin, 'Onderscheyt van de Oirdeningh der Steden', p. 14.

<sup>101</sup> For the significance of the relationships between the human figure and architecture in Renaissance building, see R. Wittkower, *Architectural Principles in the Age of Humanism*, (London 1949).

<sup>102</sup> S. Stevin, *Huysbou*, [III-4], p. 273. Cf. H. Stevin, 'Byvough', p. 105.

<sup>103</sup> S. Stevin, *Huysbou*, 'Aenteijckeningen op Serlijns en anderen / Inhoudende sommige geschillen', p. 423. Cf. H. Stevin, 'Byvough', p. 110.

Stevin was not interested in whether the dimensions corresponded to the original theory, but rather in the contemporary debate about whether it was acceptable to deviate from them. He did not consider it necessary to follow the fixed dimensions of classical architectural theory and those who commented on it, which ‘have no basis in nature’, since even the master builders of antiquity had not adhered to them.<sup>104</sup> Moreover, comparing the form and ornamentation of the architectural orders with foreign costumes, Stevin rejected the dogmatic use of objects of supposed universal beauty, as actually being tied to specific regions. The climate of the Low Countries made different demands on columns. The destructive power of storms, frost, rain and sun, the accretion of moss, vegetation and dirt lead to a more rapid erosion of delicately sculpted decorations than in warmer and drier climates. Stevin scornfully remarked that an excessive use of ornament in these circumstances was like a person who takes a pair of boots designed for walking in mud and decorates them with costly embroidery.<sup>105</sup> The use of this clothing simile is significant. Stevin defined the arrangement of the various parts of a building as the *oirdeningh* and used the term *cieraet* for ‘that which is added to this arrangement for decoration’.<sup>106</sup> Clearly, he saw ornament as mere finery, a separate matter from the actual structure of the building. To ensure that a person commissioning a building would not be blinded by the ornamentation, Stevin used every means to focus attention on the proper order.<sup>107</sup>

### *Layout of houses*

To understand Stevin’s ideas about how a house should be laid out it would be wrong to place too great a reliance on his son’s ‘Byvough der stedenoirdening vande oirdeningh der deelen eens Huys met ’t gheene daer ancleeft’. Not only were essential sections of Stevin’s original text omitted in this posthumous publication, elements were also added and the sequence altered, disturbing the internal logic of the discourse. It is therefore necessary to examine the chapters that precede and follow ‘Vande oirdeningh der deelen eens huys’. Whether the result is any more than an accumulation of hypotheses remains debatable. After all, the sequence of the chapters in *Huysbou* has not been established definitively. However, contemporary lists of contents for the chapters on the layout of towns and dwellings do tend to coincide. Moreover, other

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<sup>104</sup> S. Stevin, *Huysbou*, ‘Aenteijckeningen op Serlijns en anderen / Inhoudende sommige geschillen’, p. 419. Cf. H. Stevin, ‘Byvough’, pp. 107-109.

<sup>105</sup> S. Stevin, *Huysbou*, [III-4], p. 275. Cf. H. Stevin, ‘Byvough’, p. 106.

<sup>106</sup> S. Stevin, *Huysbou*, [III-4], p. 271. Cf. H. Stevin, ‘Byvough’, p. 103.

<sup>107</sup> S. Stevin, *Huysbou*, [III-4], p. 271. Cf. H. Stevin, ‘Byvough’, p. 103.

works in which Stevin discussed the logical presentation of scientific problems also offer clues. In broad outline, Stevin followed his initial discourse on the concept of mirror symmetry and historical examples of Graeco-Roman houses with atria, with a discussion of matters arising during the actual building process. Here he proceeded from the bottom of the house to the top, starting with the cellars, followed by the façade and the interior, concluding with the stairs, ceilings, attic and finally the roof. This general explanation of the basic principles of architecture (complete with historical authentication) and the description of the materials – the stones or bricks – used for constructing a house, was followed by a detailed and logical account of how these elements should be combined. An examination of the sequence in ‘Van de oirdeningh der deelen eens huys’ reveals that his starting point was the courtyard. Stevin used the standard method of prefacing his account with an exposition of the key concept – in this case, that of light in an interior – distinguishing between light sources in a part of a room and light entering the entire room from a courtyard, or *lichtplaets*.

In the first part of this dichotomy, Stevin cited another discourse on the galleries of courtyards, following this with a second section explaining the lighting of entire rooms. As in Greek and Roman houses (see ills. 21-24) the light in these rooms came from central courtyards. To give this classical dwelling a contemporary relevance and to show how the principle could be applied in northern climes, Stevin recalled one of his many journeys.

On the cliffs of Norway I have seen houses built in the manner of Roman atria, namely obtaining light from the centre, but covered with pig’s bladders.<sup>108</sup>

Having defined the basic elements of a house, Stevin proposed a general rule for courtyards. He examined different combinations of a central courtyard or several atria with various rooms based in each case on the same criteria: they should not be visible from the windows of adjacent houses, they should not be accessible from the outside (thus keeping out burglars), all four sides should be surrounded by houses or rooms ensuring that the courtyard never abutted directly onto the street and finally, mirror symmetry should always remain paramount.

Stevin opened his examination of the arrangement of courtyards with the plan of a large house, followed by that of a small house. In this first plan (see ill. 31), which is not in fact of a single large house but of a complex of double rows of dwellings, he arranged the rooms around 25 large, communal

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<sup>108</sup> S. Stevin, *Huysbou*, [VII-1], p. 311. Cf. H. Stevin, ‘Byvough’, p. 57.

squares and 24 small, rectangular open spaces for private use.<sup>109</sup> Drawing on a schematic plan (see ill. 32) based on an engraving of Philip II's Escorial palace, Stevin explained how these communal courtyards could be varied in number and size (three large rectangular and eight square interior spaces) while retaining their symmetry. From this Spanish *vorstelycke* (princely) residence Stevin moved on to the customary Dutch building lots of his day (see ill. 33): plots with a width of 20 to 30 feet, but a length of 200 feet or more, since the parallel streets were sometimes 300 feet apart. According to Stevin, these elongated plots, which owed their shape to the layout of the original fields and drainage ditches, resulted in 'inferior building in many places, especially in Holland where one finds a great many houses with three rooms one after another and an open area behind'.<sup>110</sup> To solve this problem Stevin divided the plots into two, with the back-aisles of each half backing onto each other. By placing the rooms of the front part of the house back-to-back, as in the figure with the 25 courtyards, an inner courtyard would be created between this section and the back-aisle, enabling light to enter all the rooms directly. A narrow corridor with windows would link the front and back-aisle of the building; a layout, Stevin noted, that was already current in Antwerp.<sup>111</sup> Having described inner courtyards, he compared their advantages to courtyards fronting onto the street: the former providing extra protection against burglars, ensuring that women could not sit in full view of the street and that amorous intruders could not to enter;<sup>112</sup> a negative aspect of inner courtyards was that people could not observe street-life, which might effect the traders and pedlars who sold their wares on the streets, they might even reduce the value of a property.

Following this discourse on atria in palaces and private houses, Stevin discussed the layout of dwellings in a single block. In 'Vande oirdeningh der Burgherlicke huysen eens blocx', he proposed this arrangement for ordinary

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<sup>109</sup> According to Stevin, this plan nevertheless produces 20 houses with some rooms on the innermost row, at the inside corners of the courts on the exterior of the block that receive no light.

<sup>110</sup> S. Stevin, *Huysbou*, [VII-1], p. 309. Cf. H. Stevin, 'Byvough', p. 55.

<sup>111</sup> S. Stevin, *Huysbou*, [VII-1], p. 311. Cf. H. Stevin, 'Byvough', p. 56: '[...] een beslooten loofken, 3 B 4 voeten breed, et sijne glase veinsters, even oft altemael een huys waer [...] Deze manier van beter oirden meyn ick t'Antwerpen meer gebruyckt te worden dan in Hollandt'.

<sup>112</sup> Cf., H. de Mare, 'The Domestic Boundary as Ritual Area in the Seventeenth Century', in: H. de Mare and A. Vos (eds), *Urban Rituals in Italy and the Netherlands: Historical Contrasts in the Use of Public Space and the Urban Environment* (Assen 1993), pp. 108-131. These courtyards should not be confused with galleries for the houses and therefore do not form part of the street. De Mare combines arguments in support of such an enclosed area with arguments which form part of an entirely different section of *Huysbou* which concern galleries for public use. Thus she creates a special 'ritual area' in which she places the woman. As Florike van Egmond rightly observed in her review, perhaps the element of seclusion was just as important as the ostensible openness, see *Bulletin Geschiedenis, Kunst, Cultuur*, 2, (1993), no. 2, pp. 123-129, esp. 126.

private houses and grander residences, allowing light to penetrate either from the street or the courtyard to all the rooms, while ensuring that neighbours were unable to look in from adjacent houses. Moreover, the block should be enclosed on all sides to keep out burglars.<sup>113</sup> In all five combinations (see ill. 35-39). Stevin preserved the symmetry ‘so that a block like this would, without adding to the cost, look more like a princely palace than a collection of common private houses’.<sup>114</sup> And although a block might comprise more than one dwelling type, thus catering to different social classes, the dwellings would nevertheless be designed to form a single homogenous entity.

Stevin followed the description of the layout of individual houses and their various combinations with ‘Van de vervougingh der camers en percken’. In his preface Stevin kept his options open.

Before I come to the point, I first want to say that it is not my intention, that this layout will please everyone, or even the majority, or a few, or that I myself will always regard it as the best; after long discussion and enquiry, however, it is the most convenient that I have up till now been able to conceive, with the aim of explaining how, having demonstrated the qualities that are required of houses in Chapter 1, in order that others may improve on the same, architecture may attain greater perfection.<sup>115</sup>

A number of conclusions can be drawn from this complex preamble. *Vervougingh*, in Stevin’s use of the word, meant an ordered arrangement based on the qualities set out in the first section of the book, with due regard for the principle of mirror symmetry. For Stevin, the only other essential quality in a house was the general availability of light through the windows of the façades and those facing the inner courtyards, as outlined in his description of atrium-based houses in the first chapter. While claiming this to be the best layout he could devise, Stevin did not rule out the possibility of future improvements, as long as they remained true to the basic criteria – this being not so much a question of inserting new elements, but of arranging these differently. As he stated elsewhere, it was a question of *’t saemschicking* – combining the rooms which together form a house.<sup>116</sup> Although Stevin named the individual rooms – A *voorsael* (hall), B *eetkamer* (dining room), C *slaepkamer* (bedroom), D *keucken* (kitchen) and E *vertreckkamer* (drawing room) – and even illustrated them

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<sup>113</sup> S. Stevin, *Huysbou*, [VII-2], p. 315. Cf. H. Stevin, ‘Onderscheyt van de Oirdeningh der Steden’, p. 24.

<sup>114</sup> S. Stevin, *Huysbou*, [VII-2], p. 315. Cf. H. Stevin, ‘Onderscheyt van de Oirdeningh der Steden’, p. 24.

<sup>115</sup> S. Stevin, *Huysbou*, [VII-3], p. 321. Cf. H. Stevin, ‘Byvough’, p. 60.

<sup>116</sup> Compare the definition in S. Stevin, *Huysbou*, [III-4], p. 271. Cf. H. Stevin, ‘Byvough’, p. 103: ‘want met oirdeningh verstaetmen der deelen eens ges[t]ichts t’ saemschicking’.

schematically (see ill. 40), their exact function at this stage remains unclear. Stevin gave no indication, for instance, of the purpose of the five rooms on the upper floor, nor of the five in the basement, only stating in the text accompanying the diagram that the latter followed the same layout as the ground floor.<sup>117</sup>

Although the purpose of these rooms had yet to be determined, Stevin gave all the dimensions of the five courtyards, and so also of the other rooms in the house: approximately 34 by 17 feet for the hall and 17 by 21 feet for the other rooms.<sup>118</sup> It is striking that the availability of light formed the basic premise in both the plan and the elevation. For example, the ground-floor rooms and their adjoining service areas, as well as the rooms in the attics, were all lit from cross-windows in the façade. Indeed, Stevin remarked with some emphasis

[...] that all the windows fit equally high and equally wide in the façades, without the least distortion and with perfect like-sidedness.<sup>119</sup>

Having arranged the rooms to create the layout of a house based on the principle of mirror symmetry ('together making a like-sided rectangular shape') and availability of light, Stevin presented a second drawing completing the design with staircases, chimneys, doorways, privies and other elements (see ill. 41). Besides various remarks on these areas, Stevin also added a more detailed description of the rooms. For a proper understanding of Stevin's layout, it should be noted that apart from these amenities, the rooms to the left and to the right of the reception room were not identical in size but that the whole nevertheless conformed to the principle of mirror symmetry. It was not the dimensions, rather the symmetry that formed the constant factor in the design. Having explained this second, more detailed drawing, Stevin moved on to the distribution of the various functions of the house. Here Stevin's comparison of the *voorsael* with the market as a meeting place for burghers in the town centre provides a clue.<sup>120</sup> This room not only functioned as a meeting place for the family and for receiving guests, it was the focal point of domestic circulation, 'the middle of the house, so that the rooms and staircases exit onto it in proper fashion'.<sup>121</sup> Stevin discussed the building's internal circulation in some

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<sup>117</sup> S. Stevin, *Huysbou*, [VII-3], p. 323. Cf. H. Stevin, 'Byvough', p. 62: '[...] the lines that indicate these compartments, represent walls rising from the bottom of the cellars to the highest part of the house up against the roof, together making the like-sided square form as one can see'.

<sup>118</sup> Compare chapter 7, n. 318. The system of proportions in Stevin's house is more fully dealt with in H. de Mare's, *Het huis en de regels van het denken. Een cultuurhistorisch onderzoek naar het werk van Simon Stevin, Jacob Cats en Pieter de Hooch*, (4 vols), PhD thesis, 28 January 2003

<sup>119</sup> S. Stevin, *Huysbou*, [VII-3], p. 323. Cf. H. Stevin, 'Byvough', p. 61, see also p. 63.

<sup>120</sup> S. Stevin, *Huysbou*, [VII-3], p. 323. Cf. H. Stevin, 'Byvough', p. 62.

<sup>121</sup> S. Stevin, *Huysbou*, [VII-3], p. 323. Cf. H. Stevin, 'Byvough', p. 62.



detail.<sup>122</sup> This was not simply a matter of ancillary rooms being accessible from a central space, it was about providing the individual rooms with a logical layout based on this circulation. He applied this internal logic first to private houses and then to palaces. In private houses the ancillary rooms should never be accessible to strangers without their first having to pass through the central reception area. Privacy was also an important aspect of the internal arrangement of adjoining rooms. Thus Stevin noted that it was better to go from the dining room to the bedroom than vice versa. Practical considerations formed another important factor. It was more convenient to go from the kitchen to the *bottelrie* (pantry) or to the *morsboek* (scullery), where the washing up was done, than to have to pass through these service areas to reach the kitchen.<sup>123</sup>

Stevin adopted a similar approach to the vertical layout. The rooms of the head of the household, for example, should be situated above one another. Directly below the study, in the cellar, was the place to keep valuables such as jewellery and confidential documents; above it, the library was where guests could be received without having to pass through the ancillary rooms.

This separation of public and private areas was also a feature of the layout of the rooms and courtyards of palaces (see ill. 42). While the noisy stables and kitchen block were located to the left and right of the main courtyard respectively, housing the soldiers guarding the entrance, the prince's apartments – with on either side the rooms for his wife and ladies-in-waiting and quarters for guests and their retinues – were situated in the quieter, more secluded part behind the chapel. In this way, Stevin explained, they would not be inconvenienced by the stench of the horses and the bustle and noise of the kitchen. Stevin also devised a logical sequence for the various princely apartments, guarded by sentries, which had to be passed before reaching the last room, the bedchamber. A similar system also existed for the consort's private bedchamber, enabling the prince to visit her without being seen by other members of the family or household. And like the private town house, the palace also had a vertical arrangement designed to ensure the privacy of the prince and his wife.

The meticulous detail with which Stevin examined the separation of the private and the more or less public rooms is revealed in the section on 'Vant

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<sup>122</sup> S. Stevin, *Huysbou*, [VII-3], p. 329: On the choice of rooms or compartments, each to its own use with an account of which ones one may properly go through to reach the other ones and which not.

<sup>123</sup> In Stevin's arrangement there is no direct connection between the kitchen and the dining room, in contrast to H. de Mare's assertion in 'De keuken als voorstelling in het werk van Simon Stevin en Jacob Cats', in: C. Bouw, J. de Bruijn and D. van der Heiden (eds), *Van alle markten thuis: Vrouwen en genderstudies in Nederland; Bundel ter gelegenheid van het Landelijke Congres Vrouwen/Genderstudies op 28 en 29 oktober 1993*, (Amsterdam 1994), pp. 185-198, esp. 190.

open en toegaen der deuren, mitgaders ghedachtenissen op sloten en sleutels?. Here Stevin proposed a system based on thirty-six keys, six of which were in the exclusive possession of the master of the house, giving entry to all the rooms, while the remaining thirty keys provided access to all but the six private rooms. Moreover, the lady of the house would have separate passkeys for her jewellery cabinets and linen cupboards, also providing access to all the other rooms, except for those that only responded to the six special keys of the master of the house. None of the thirty-six keys, however, apparently not even those of the master of the house, would provide access to where she kept her valuables.

Perhaps Stevin stopped working on the passages dealing with the layout of the remaining parts of the house, the courtyards, galleries and other amenities pertaining to the various rooms since their diversity made them difficult to arrange. Moreover, his son probably found the surviving fragments on this subject too detailed for his discourse on the arrangement of the house in *Materiae Politicae*, relegating them to the ‘precise details’ that he planned to discuss in a future publication of *Huysbou*.

### *Layout of towns*

Clear parallels exist between Stevin’s presentation of his ideas on the layout of houses and his ‘Vande oirdeningh der steden’. ‘Vande oirdeningh der deelen eens huys’ was prefaced by an explanation of the elements that make up a house; Stevin’s description of the layout of towns followed the same format. Despite the suggestion of the title ‘Vande middelen daermen groote machtighe Steden deur maken can’, the introduction does not start by addressing financial and other planning constraints before discussing the layout of a town, focusing instead on its size and on the public facilities that a town requires. Just as Stevin placed his mirror-symmetrical house in a historical context by drawing analogies with ancient atrium-based houses and by referring to classical and Italian architectural theory, he also mentioned historical ideas on the size of towns. Stevin rejected Aristotle’s view that large cities were less conducive to a peaceful and pleasant existence. Instead he emphasised the advantages of the wide choice of natural and manufactured products, the time saved in travelling for administrators located within a small radius and the availability of artists for private lessons, as well as educational establishments, including universities, for those who wished their children to acquire the basic skills of reading and writing. Stevin also dismissed the argument that uprisings were less likely in small or medium-sized towns, pointing out that little was known about this and that the impact of a revolt in a smaller town would be proportionately greater. In addition to drawing on theories from antiquity on the ideal size

of a town, Stevin also proposed to discuss practical examples of ‘the great cities such as Nineveh, Babylon, Cairo, China etc’, although no record of these notes exists.<sup>124</sup> The preface ends:

In conclusion it may be that some are more fortunate here and others there, but speaking generally, the most pleasant form of the good life seems to be in the largest and most populated rich and powerful cities, since constant expansion occurs there, and is still to be expected. And with this enduring orderly increase in mind I will describe the layout of these cities.<sup>125</sup>

Stevin was clearly not seeking to define the town as an object, but rather to give a general description of its scale and, consequently, its principal facilities. For Stevin, towns were not static, but living and growing organisms that should nevertheless evolve in an orderly fashion. What this implied in Stevin’s discussion of towns elsewhere is discussed further below.

In the next section, ‘Van de verkiesinghe der plaets daermen de Steden wil legghen’, Stevin turned briefly to the optimum conditions and location for a town. He employed the same structure in his preamble as in the introduction to ‘Vande oirdeningh der deelen eens huys’, which listed the essential parts of a house and outlined the issues involved, although here he made his points at a more implicit level. It is worth comparing the body of the text – ‘Vande form der steden’ – with Stevin’s treatment of the layout of houses. As in ‘Vande oirdeningh der deelen eens Huys’, where Stevin grouped one or more rooms around a central courtyard, the rectangular building lot formed the basic element of his town.

The four-sided rectangle on a flat level piece of ground is in my opinion the most convenient shape for cities, in order that they may contain suitable rectangular blocks, such as plots, houses, gardens, markets and squares, which do not fit in another shape; because pentagonal and polygonal cities, although they can be drawn in a circle, with a well-ordered market in the centre and streets from there to the bastions, all with a like-sided form, yet many houses, blocks and plots become lopsided and broader at one end than at the other, as can be seen in Palma.<sup>126</sup>

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<sup>124</sup> See Appendix E, p. 492. Cf. H. Stevin, ‘Onderscheyt van de Oirdeningh der Steden’, p. 9 (see note H.S.).

<sup>125</sup> S. Stevin, *Huysbou*, [VIII-1], p. 349; cf. H. Stevin, ‘Eenighe stucken der Crychconst; Beschreven deur Simon Stevin’, KB 128 A-9II, fol. 3v.

<sup>126</sup> S. Stevin, *Huysbou*, [VIII-3], p. 353. H. Stevin, ‘Eenighe stucken der Crychconst; Beschreven deur Simon Stevin’, KB 128 A-9II, fol. 5r. In the printed version Hendrick Stevin inserted ‘Coevooren’ [Coevorden]. Cf. H. Stevin, ‘Onderscheyt van de Oirdening der steden’, p. 25 (i.e., p. 17).

Like his house, which he assembled with *camers* ('rooms') and *percken* ('courts'), Stevin built his rectangular town with square blocks. But while the suggestion in 'Vande oirdeningh der Burgherlicke huysen eens blocx' is that the houses themselves could be combined in both square and rectangular blocks, in his town plan Stevin consistently arranged his buildings in squares. Stevin was apparently more concerned with demonstrating the principle that the layout of houses and that of towns should be analogous, than to match buildings of different shapes and sizes.<sup>127</sup> But just as he combined several houses to form a single block in 'Vande oirdeningh der Burgherlicke huysen eens blocx' (see ill. 35-39), in 'Vande oirdeningh der steden' Stevin also combined several blocks to form larger units. While the small churches and markets occupied single square blocks, the principal church, market, town hall, university and workhouse extended over rectangles of two connecting square blocks, moreover the palace was situated on a long narrow plot of no less than twelve blocks. Stevin's grid was not just a rational way of parcelling out the available land, it also illustrated his ideas about symmetry as an organising principle of functions in a variable hierarchical order. Equivalent and complementary public facilities were situated on either side of the central latitudinal axis: the meat market, for example, opposite the fish market, the corn market opposite the cattle market and the timber market opposite the stone market, while churches of similar size were also located symmetrically. However, the buildings along this latitudinal axis, with functions of differing hierarchical order and of different sizes – from palace to poorhouse – were longitudinally asymmetrical (ill. 4).

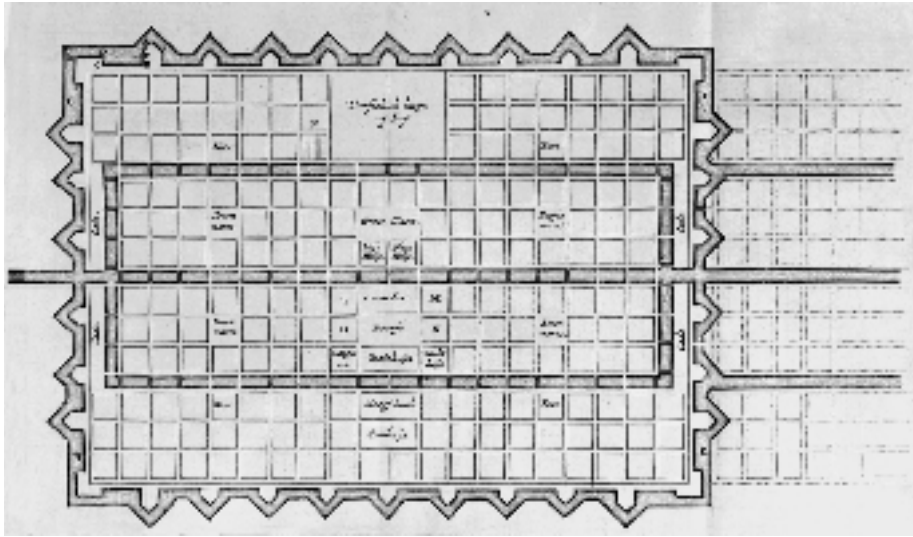
Stevin's axial layout placed him in a unique position in relation to the authors of architectural treatises of antiquity and the Italian Renaissance. In designing their ideal towns, churches and other major edifices the latter generally opted for a central plan – a circle, square or polygon within a circle – in which the functions were ordered in a concentric hierarchy. The chapter 'Van de Lycksydighe vergrooting der Stadt' ('On the like-sided expansion of the town') illustrates the difference between Stevin's design and that of previous architectural treatises further.

### *Urban extensions*

Most classical or Renaissance writers tried to solve the problem of population growth within the perimeter of their towns or, occasionally, in satellite extensions laid out radially as a logical continuation of the central plan. Stevin,

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<sup>127</sup> Van den Heuvel, 'Stevin et Ramus' and idem, *Papiere Bolwercken*, pp. 145-146.



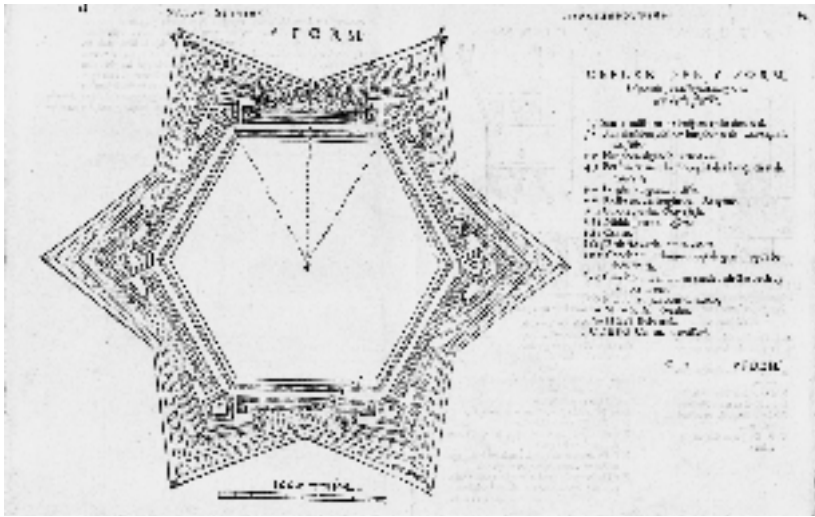
Ill. 4 Stevin's ideal city of around 1605-1610 published by Hendrick Stevin, *Materiae Politicae* (1649)

however, also apportioned space outside the walls along both narrow sides of his town.<sup>128</sup> Thus it could expand without increasing the distance between the centre and the exterior of the long walls. Besides the functional advantages of this layout, here Stevin was again concerned with his highly original ideas about symmetry.<sup>129</sup> For a city which took more than three days to traverse, such as Babylon, he suggested cruciform extensions radiating from a long narrow rectangular centre. This plan (see ill. 46) also differed from the radial extensions in Italian architectural treatises, which were symmetrical in all directions.

Stevin's method of organisation differed from those found in existing architectural treatises in both concept and practice. He was not concerned with achieving parallels in size and numbers of houses, towns and urban extensions, nor was he interested in an urban model in which these opposites were harmoniously reconciled, but rather in the analysis, presentation and solution of problems as they occurred at particular levels. Yet alongside this, Stevin was sure of one thing, that the layout of houses, towns and urban extensions should be based on a single principle – that of mirror symmetry.

<sup>128</sup> Examples of similar satellite towns radially situated around a central town can be found, for example, in Francesco di Giorgio Martini, *Accademia di Belli Arti*, Codex. E. 2.1.28, fol. 24 and Leonardo's designs for the extension of Milan, *Codex Atlantico*, see C. Pedretti, 'Leonardo's Plans for the Enlargement of the City of Milan', in *Raccolta Vinciana*, (1962), xix.

<sup>129</sup> S. Stevin, *Huysbou*, [VIII-3], p. 367; cf H. Stevin, 'Eenighe stucken der Crychconst; Beschreven deur Simon Stevin', KB 128 A-9II, fol. 10v.



Ill. 5 Hexagonal fortificationsystem in *Sterctenbouwing* 1594

*Interpretations of Stevin's dwellings and towns*

Curiously, the first historian to link Stevin's remarks on private houses with his comments on town planning was a specialist on fortifications. This suggestion by Alex Brialmont, a Belgian military engineer, formed part of a discourse on *Oeuvres Militaires* in a publication mainly devoted to other areas of Simon Stevin's civil interests.<sup>130</sup> In 1846, when Brialmont published his findings, he was only familiar with Stevin's texts in *Materiae Politicae*, which is why he kept to that sequence, the discussion of private houses following that of town planning. However, it is to Brialmont's credit that, unlike many subsequent authors, he did not ignore the texts omitted in this posthumous publication and referred to the absent passages of *Huysbou*. As a military engineer he was especially interested in the missing remarks on hydraulic engineering. In fact Brialmont did not refer to Stevin's discussion of fortification systems in his treatment of town planning, which he presented as part of the author's military oeuvre. Actually, the omission appears to have been deliberate. Having rejected the radial plan and basing his town instead on square plots,<sup>131</sup> Stevin had moved away from the defence system that he had proposed in his *Sterctenbouwing* of 1594. (ill. 5)<sup>132</sup> This was not an attempt to integrate military and civil functions.

<sup>130</sup> A. Brialmont, 'Oeuvres militaires de Simon Stevin' in M. Steichen, *Mémoire sur la vie et les travaux de Simon Stevin*, (Brussels 1846), pp. 105-152. For a further discussion of this work see part II.

<sup>131</sup> S. Stevin, *Huysbou*, [VIII-3], p. 353; H. Stevin, 'Eenighe stucken der Crychconst; Beschreven deur Simon Stevin', KB 128 A-9II, fol. 5r.

<sup>132</sup> Although not much attention is paid in *Sterctenbouwing* to the internal layout, Stevin's observations on the street system for supplying the bastions indicate that he advocated a radial town plan.

Although his town plan had a fortified perimeter and although he tried to resolve the angular bastions at the corners resulting from the rectangular form by doubling the length of the flanks of the adjacent bastions (compare ill. 43 and 48-49), Stevin's town was based primarily on civil functions and military considerations took second place. In an exhaustive analysis of *Sterctenbouwing*, Brialmont expressed nothing but praise for Stevin's fortifications; he must, however, have been less enamoured of the defence solutions Stevin proposed in 'Vande oirdeningh der steden'. Brialmont remarked that Stevin's observations on the private house would still be relevant in the modern age, if the passages on the properties of materials and their use in the various sections of the building, as well as the chapters on churches and warehouses had not been lost. Interestingly, he also noted that to understand Stevin's *Huysbou* it should be borne in mind that the only publications on the subject available at that time were copies of Vitruvius and other architectural treatises on large buildings, and that Stevin was one of the first writers to pay particular attention to *l'architecture bourgeoise*.<sup>133</sup>

It was this aspect that Annie Romein explored in her splendid portrait of Stevin of 1938 in the celebrated series *Erflaters van onze Beschaving*.<sup>134</sup> Given her Marxist view of history, it is hardly surprising that she focused on the hierarchical arrangement of towns and houses and its implicit class system. She was full of praise for Stevin:

He designed his city with straight streets and canals so that no citizen should have to live at an inconvenient distance from the market, church or city gate [...]. His plea for the systematic addition of galleries is philanthropic, while showing a sober understanding of human needs.<sup>135</sup>

In fact Romein conveniently overlooked Stevin's argument that the importance of these galleries lay in the fact that they prevented the poor from getting drenched and thus catching diseases which, being infectious, would also affect the rich.<sup>136</sup>

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<sup>133</sup> A. Brialmont, 'Oeuvres militaires de Simon Stevin', pp. 140-141.

<sup>134</sup> J. and A. Romein, *Erflaters van onze beschaving Nederlandse gestalten uit zes eeuwen*, vol. 1, '14<sup>e</sup>-16<sup>e</sup> eeuw', (Amsterdam 1938), pp. 245-283.

<sup>135</sup> *Ibid.*, p. 279.

<sup>136</sup> S. Stevin, *Huysbou*, [VIII-3], p. 367. Cf. H. Stevin, 'Eenighe stucken der Crychconst; Beschreven deur Simon Stevin', KB 128 A-9II, fol. 10r. This did not originally form part of the text on towns. K. van Berkel has already drawn attention to Romein Verschoor's one-sided interpretation of this argument in his extremely lucid historiographical essay, 'Annie Romein, Simon Stevin en de wetenschapsgeschiedenis', in: H.M. Beliën (ed.), *Vijftig jaar erflaters: Een terugblik op de 'Erflaters van onze beschaving' van Jan en Annie Romein*, (Rotterdam 1990), pp. 43-57, esp. 51.

In the first, more or less comprehensive study of Stevin's life and work, which appeared five years after Romein's portrait, the mathematician Eduard Jan Dijksterhuis also pointed out that Huysbou provides a 'welcome addition to our understanding of his personality'.<sup>137</sup> Shortly before reading Romein's *Erflaters*, Dijksterhuis had read the recent edition of *Het Burgerlick Leven*,<sup>138</sup> which may have prompted the observation that 'the value of what Stevin repeatedly states about the layout of a house should not be underestimated for our knowledge of ordinary domestic life three hundred years ago'.<sup>139</sup> This interest in the social aspect of Stevin's private house is all the more striking since Dijksterhuis concurred that Stevin's work was 'of little importance for the history of architecture'.<sup>140</sup>

Thirty years later, Ed Taverne took a different view. Taverne was the first to analyse Stevin's treatise from the perspective of town planning and architectural history. In *In 't Land van Belofte* in 1978, he discussed seventeenth-century urban development in the light of the concept of the ideal town that emerged in Italy.<sup>141</sup> Taverne saw Stevin's treatise on the building and layout of towns as an important link in the introduction of Italian town-planning theories in the Low Countries.<sup>142</sup> Taverne analysed every aspect of Stevin's ideas about towns – administrative, economic, military, circulation and planning – while attempting to connect these to Dutch and Italian texts on town planning. The similarities he saw with the theme of the ideal town in Italian treatises persuaded Taverne that Stevin's town was intended as a model to which details could be

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<sup>137</sup> Dijksterhuis, *Simon Stevin*, p. 269.

<sup>138</sup> A. Romein Verschoor, *Het Burgerlick Leven*, (Amsterdam 1939; revised edition).

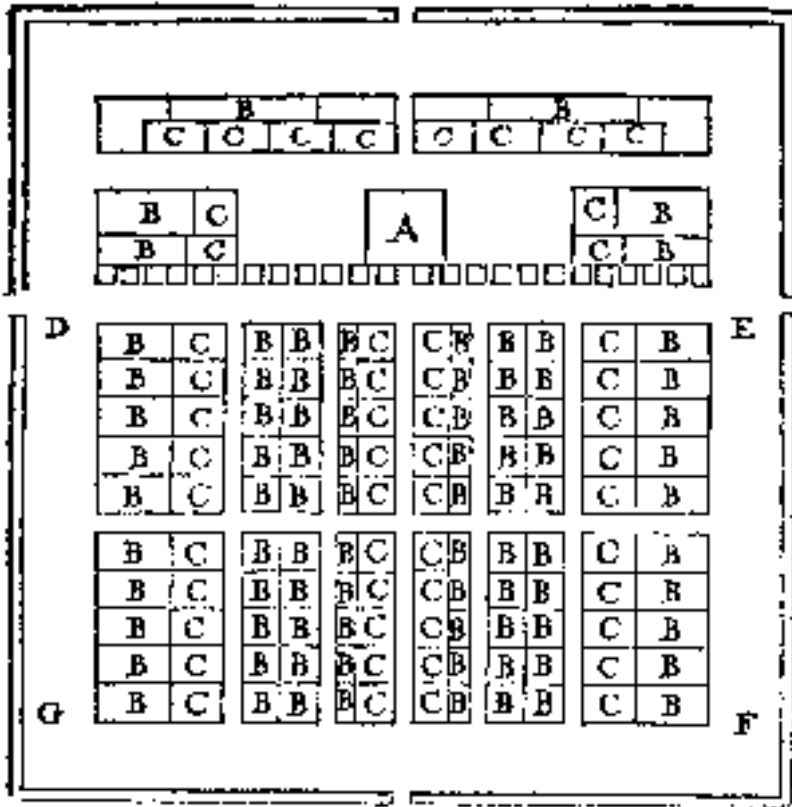
<sup>139</sup> Dijksterhuis, *Simon Stevin*, p. 269. For an assessment of Dijksterhuis's critical review of Romein's new edition of Stevin's *Het Burgerlick Leven*, see Van Berkel, 'Annie Romein', p. 52.

<sup>140</sup> Dijksterhuis, *Simon Stevin*, p. 269. Dijksterhuis came to this unequivocal conclusion after consulting a number of specialists, including the architectural historian J.H. Plantenga and the urbanist J.M. de Casseres. The latter maintained that Stevin's town model contained few original ideas. For this, see Leiden, Museum Boerhaave, Dijksterhuis Archive S. 10.543, archive 471-no. 170a. And much more recently, in an inaugural speech with the promising title: 'Stevin en het Bouwen', [delivered by J.H. van Loenen on 17 October 1984 on his appointment as professor of road and hydraulic engineering at the Koninklijke Militaire Academie in Breda] various other works by Stevin were mentioned, but not *Huysbou* or its various partial publications.

<sup>141</sup> Taverne, *In 't land van belofte*. For a critique of this approach from the perspective of the history of architecture, see Van den Heuvel, *Papiere Bolwercken*, pp. 14–22, esp. 19–20. For a critique on the relationship suggested by Taverne between Christianstad and Stevin's town plan, see J. Roding, *Christiaan IV van Denemarken (1588-1648): Architectuur en stedenbouw van een Luthers vorst*, (Alkmaar 1991), pp. 88 and 90. For a critique from a sociological viewpoint, see B. Kempers and K. Schmidt, "'In 't land van belofte': kunstgeschiedenis en sociologie', in *Amsterdams sociologisch tijdschrift*, (1979/80), no. 2, pp. 340–352.

<sup>142</sup> Taverne, *In 't land van belofte*, p. 49.





Ill. 6 Plan of army camp in *Castrametatio. Dat is Legermeting* 1617

added.<sup>143</sup> Despite recognising the virtual absence of urban extensions in the tradition of the Italian architectural texts, Taverne saw Stevin's town as an idealised form, an object onto which new developments could be tacked once all the details had been settled, rather than a growing organism in which the nucleus of the house formed the basis of an orderly extension based on the rules of mirror symmetry.<sup>144</sup>

Taverne explored the background to Stevin's town in two further studies. In 'Simon Stevin: theoreticus van het moderne krijgsbedrijf', he proposed the interesting thesis that Stevin's design of 1617 for a military camp (ill. 6) in his

<sup>143</sup> Taverne, *In 't land van belofte*, p. 45: 'In Stevin's models the mathematical grid pattern of the ideal city is transposed onto individual blocks, each of which is made up of dwelling units in strictly square forms.'

<sup>144</sup> *Ordentlicke vermeerderingh*; see above, note 129.

*Castrametatio, Dat is Legermeting* ‘formed the basis of Simon Stevin’s plan for the ideal city’.<sup>145</sup> His comparison of the two plans (see ills. 4 and 6) revealed a striking similarity in the use of square blocks for the construction of the grid. Moreover, the link between military camps and town planning had a long historical tradition in architectural writing. The celebrated architect Andrea Palladio had written a monograph on the military camps of antiquity, Pietro Cataneo had illustrated them alongside his designs for towns and Sebastiano Serlio had planned to publish a text on the subject entitled *Della Castramentazione Di Polibio Ridutta in Una Citadella Murata*.<sup>146</sup> Less well-known perhaps were Pierre Lepoivre’s splendid illustrations in Madrid of the military camps of Mansfelt and Maurice, intended for an unfinished treatise on architecture, fortifications and perspective.<sup>147</sup> However, some caution is required here. It is far from clear that Stevin’s ideas for the layout of towns derived from that of the military camp. For example, Stevin’s *Castrametatio* was based around an extensive description of the camps at the siege of Jülich of 1610, explaining the difference between the arrangement of camps described by ancient writers such as Polybius and the accommodation of Maurice’s State troops.<sup>148</sup> Moreover, the manuscripts on the subject ascribed to Stevin were not written earlier.<sup>149</sup> A similarity is evident between the preface of ‘Vande form der steden’ and of ‘Leering in chrijchshandel van het logieren, naederen en veltslach’ (‘Theory of warfare on quartering, advance and battle’), but this passage had no

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<sup>145</sup> E.R.M. Taverne, ‘Simon Stevin: theoreticus van het moderne krijgsbedrijf’ in: J. Sneep, H.A. Treu and M. Tydeman (eds), *Vesting: Vier eeuwen vestingbouw in Nederland*, (The Hague 1982), pp. 24-29, esp. 29.

<sup>146</sup> A. Palladio, *I commentari di C. Giulio Cesare, con le figure in rame de gli alloggiamenti, de’ fatto d’arme, delle con circonvallazioni delle città etc.*, (Venice 1575). See J. R. Hale, ‘Andrea Palladio, Polybius and Julius Caesar’, *Journal of the Warburg and Courtauld Institutes*, 40, (1977), pp. 240-255; P. Cataneo, *I primi quattro libri di architettura*, (Venice 1554; enlarged edition, Venice 1567); S. Serlio, *Della castramentazione di Polibio ridutta in una citadella murata*, Bayerische Staatsbibliothek, Munich, Codex. Icon. 190; P. Marconi, ‘Un progetto di Città Militare: l’VIII libro inedito de Sebastiano Serlio’, in *Controspazio*, (1969), vol. 1, no. 1, pp. 51-59, and vol. II, 3, pp. 53-59. This was in fact not Serlio’s eighth book, see J.G. Johnson, *Sebastiano Serlio’s treatise on military architecture*, [PhD University of California], Los Angeles, 1984, (UMI: Ann Arbor 1988).

<sup>147</sup> Madrid, Palacio Real II, 523 fol. 47r fol. 61r.

<sup>148</sup> Several of the officers whom Stevin mentions in his description were in fact only involved in Maurice’s later campaigns.

<sup>149</sup> See W.H. Schukking’s introductions in *The Principal Works of Simon Stevin*, vol. IV, pp. 8-16 and pp. 249-259, C. van den Heuvel, ‘Simon Stevin, De Crychconst/Le traité incomplet’, (Brussels 2004) and C. van den Heuvel, ‘De legerent als bibliotheek. Vroeg zeventiende-eeuwse theorieën over legerhervormingen en logistiek in het veld’ in *Oostende verloren, Sluis gewonnen 1604, Een kroniek in kaarten, Catalogus bij een tentoonstelling in de Leidse Universiteitsbibliotheek van 12 augustus – 12 september 2004 door Dirk de Vries, met bijdragen van Charles van den Heuvel, Anton van der Lem, Piet Lombaerde, Universiteitsbibliotheek Leiden 2004*, Leiden 2004, pp. 27-46

bearing on *Castrametatio*.<sup>150</sup> In the latter work, on the other hand, Stevin pointed to the conformity between the symmetrical order of a military camp and the ‘symmetry [...] to which the ancient architects paid particular attention in their buildings’.<sup>151</sup> After revealing Maurice’s objections to Polybius’ camp, Stevin proposed a variant of another example from antiquity, that of Xenophon. The advantage of this was that the general’s quarters could still be centrally placed, as Maurice wanted, while retaining the mirror symmetry, as the accompanying drawing showed. Stevin’s emphasis on Maurice’s objections suggests that he probably wanted to start with Polybius’ layout in which the symmetrical arrangement and eccentric positioning of the commander’s quarters show striking similarities to the layout of Stevin’s town. Although it is not known precisely when Stevin conceived his ‘Vande oirdeningh der steden’, it is likely that he developed his ideas on the subject either at the same time or at a much earlier stage. Thus *Castrametatio* should not be seen as a model for Stevin’s town; rather both his military camp and his town were based on a common system: an arrangement of squares making a larger whole that conformed in all parts to the laws of mirror symmetry.<sup>152</sup>

In his second study, ‘Stevens koopmanstad’ (‘Stevin’s merchant city’) of 1984, Taverne continued his investigation into the origin of Stevin’s model, while relating it to actual urban layouts in the Republic. Here again Taverne highlighted the military camp analogy, linking the references to Hebrew manuscripts in *Castrametatio* to the layout of towns.<sup>153</sup> Taverne defined Stevin’s town as a typical pragmatic and neutral model of a merchant town, arguing that, like a logically organised military camp, its purpose and function was based on its

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<sup>150</sup> The discussion on ‘logieren, naederen en veltslach’ formed part of the unfinished treatise *Vande Crychconst*. On this text, see W.H. Schukking’s introductions in *ibid* and C. van den Heuvel, “Simon Stevin, ‘De Crychconst/Le traité incomplet’”, (Brussels 2004)

<sup>151</sup> S. Stevin, *Castrametatio, Dat is Leggermeting*, [Rotterdam 1617; p. 42], in *The Principal Works of Simon Stevin*, vol. IV, (Amsterdam 1964), pp. 367-369: ‘lijezijdicheyt, daer de oude Boumeesters [Architecti] in ghestichten ernstelic op letteden.’

<sup>152</sup> For the relationship discussed here, namely the possible link between Ramus’s presentation of scientific problems and Stevin’s orderly arrangement of towns, it is worth mentioning that Ramus also wrote an essay on the organisation of military camps which was in Maurice’s library and which Stevin may have known of, namely P. Rami, *Liber de militia C. Julii Caesaris*, (Frankfurt 1584); see A.D. Renting and J.T.C. Renting-Kuijpers (eds), *The Seventeenth Century Orange-Nassau Library: The catalogue Compiled by Antonie Smets in 1686, the 1749 Auction Catalogue, and Other Contemporary Sources*, (Utrecht s.d.), p. 550.

<sup>153</sup> E.R.M. Taverne, ‘Stevens koopmanstad’ in: M. Jonker, L. Noordegraaf and M. Wagenaar (eds), *Van stadskern tot stadsgewest: Stedebouw/undige geschiedenis van Amsterdam*, (Amsterdam 1984), p. 99: ‘From this perspective Stevin’s city model can be regarded as the outstanding example of a pre-industrial urban grid, an urban form which, moreover, in its dimensions, parcellation and ground pattern goes back to biblical origins’.

ability to provide a reproducible, site-adaptable scheme for the most flexible and efficient organisation of the wide variety of urban life.<sup>154</sup>

Taverne related *Huysbou* to the principal merchant metropolis of the day, observing that this ‘treatise was related in a concrete way to the practical urban developments taking place in the Republic, particularly to the 1613 extension of Amsterdam’.<sup>155</sup> In recent studies, Taverne has introduced the concept of the ‘bookkeepers’ city’, geared to the efficient exploitation of the available terrain by organising the area in as practical and lucrative a manner as possible.<sup>156</sup> The absence of prestigious public open spaces was to make the 1613 extension of Amsterdam a prime example of the ‘bookkeepers’ city’ whose ideal, Taverne has maintained, had already been formulated by Stevin in ‘Vande oirdeningh der steden’. Although this comparison is interesting in terms of the way dwellings are ordered into blocks, it ignores the hierarchy of public facilities in small and large urban squares and churches, as well as the symmetrical organisation of Stevin’s town plan.

Although Stevin’s writings on the layout of private houses and towns remained unpublished, Taverne has assumed that his ideas did enjoy a certain currency. And while Taverne may have occasionally overstated his case, claiming, for example, that Stevin was ‘principally writing a practical manual’, his main concern has been to discuss whether an architectural treatise could influence the ideas of administrators on contemporary urban problems, such as the organisation, design and layout of a town.<sup>157</sup> Casper van der Hoeven and Jos Louwe have gone further, noting that Stevin’s ‘ideal merchant city’ (together with Speckle’s ‘ideal fortified city’) was a crucial notion in the

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<sup>154</sup> Taverne, ‘Stevens koopmanstad’, p. 99.

<sup>155</sup> Taverne, ‘Stevens koopmanstad’, p. 91.

<sup>156</sup> E.R.M. Taverne, ‘Stedelijk Mecenaat. De Amsterdamse koopman als opdrachtgever van het stedelijk milieu (1613)’, in A.H. Huussen jr and B. Kempers (eds), *In opdracht van de staat. Opstellen over mecenaat en kunst van de Griekse polis tot de Nederlandse natie*, (Groningen 1994), pp. 95–111, esp. 106–108. Taverne states that he borrowed the concept of a bookkeeper’s city from Erik Terlouw’s *Het theater van de gelijkenis: Architectuurtheorie in Frankrijk 1500–1640*, (PhD diss., TU Delft 1988). Here the author argues that the divide between sixteenth- and seventeenth-century architectural designs lies not in the difference between radial and chessboard plans, but in the difference between designs intended to prescribe a town’s architecture and pragmatic models geared to building land distribution. Terlouw cites the plans of Jean Errard de Bar-Le-Duc as an example of the latter group. See also E. Terlouw, ‘De zegels van de stedeboouw: De stad als architectonisch ontwerp in de renaissance’, in *Oase*, 25, (1989), pp. 2–21, esp. 12–13. Taverne’s later comparison between these otherwise military plans and Stevin’s city is not applicable, given that Errard places the convenience of the right angle above the beauty and symmetry of the design, in contrast to Stevin for whom symmetry was the main organisational principle.

<sup>157</sup> Taverne, ‘Stevens koopmanstad’, p. 92.



Ill. 7 Morphological analysis of Stevin's city by Van der Hoeven/Louwe (1985)

training of surveyors and engineers.<sup>158</sup> After explaining that it was the task of military engineers to design the defences around a town, while surveyors were responsible for the effective division of the enclosed area, they compared both 'models' with Amsterdam's seventeenth-century ring of canals. Although they exaggerated somewhat in suggesting that Stevin's 'Vande stedenoordening' (along with Speckle's treatise on fortifications) were the model for this urban extension, their morphological analysis of the way Stevin ordered his town is nonetheless instructive (ill. 7).<sup>159</sup>

The emphasis in current research on the rationality of Stevin's ideas on architecture and especially on the private house has been criticised by Heidi de Mare.<sup>160</sup> She has taken a radically different approach, interpreting the layout of Stevin's house and town from the perspective of gender. The basic premise of this original approach is stated most effectively in her article, 'A rule worth following in architecture?' The significance of gender classification in Simon

<sup>158</sup> C. van der Hoeven and J. Louwe, *Amsterdam als stedelijk bouwwerk: Een morfologische analyse*, (Amsterdam 1985), esp. pp. 53-76.

<sup>159</sup> Van der Hoeven e.a., *Amsterdam als stedelijk bouwwerk*, p. 56: This analysis once again confirmed that Stevin's town comprises '[...] a sum total of identical plots, in contrast to the geometrical subdivision of a city plan into plots'.

<sup>160</sup> Earlier, in 'Annie Romein', p. 51, K. van Berkel pointed out that thinking in terms of usefulness and efficiency only has a limited significance, and that anyone writing a portrait of Stevin today would have to evaluate him from another angle. My study does not deny the rational aspect in Stevin's work, but it does take into account Van Berkel's warning that the concept of rationalism is one that changes over the course of time.

Stevin's architectural treatise'.<sup>161</sup> Stevin wrote relatively little on the subject of women. That Dutch women supposedly preferred white walls and clean pavements reveals nothing about the layout of a house or a town. It is as irrelevant as Stevin's remark that the use of gargoyles as ornaments should be avoided 'because they are distressing to pregnant women'.<sup>162</sup> Furthermore, the ingenious system of keys says more about the separation of private and communal areas than about the layout of the rooms. More interesting, however, are Stevin's references to certain parts in and outside the building, intended specifically either for the man or the woman of the house. And it is these relatively scarce references that have caught De Mare's attention. In Stevin's single-family dwelling, a private staircase was reserved for the head of the house to access the private rooms above and below his study, while his wife had to share the other stairs with the rest of the family and household. In princely residences, as well as in large urban palaces, the wife had her own staircases to reach the rooms and cellars below and above her bedchambers. But this is a different category of domestic order from the first example cited by De Mare.<sup>163</sup> In addition, the key system whereby six of the thirty-six keys were exclusively for the woman's use was not intended for the ordinary private house, but for larger urban palaces.<sup>164</sup> Two types of layout featured a differentiation between men and women. Where space was at a premium, men had privacy

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<sup>161</sup> H. de Mare, 'A rule worth following in architecture? The significance of gender classification in Simon Stevin's architectural treatise', in: Els Kloek, Nicole Teeuwen and Marijke Huisman (eds), *Women of the Golden Age: An international debate on women in seventeenth-century Holland, England and Italy*, (Hilversum 1994), pp. 103-120. Later she returned to this argument in idem, 'Domesticity in Dispute: A Reconsideration of Sources', in I. Cieraad (ed.), *At Home: An Anthropology of Domestic Space*, (New York 1999), pp. 13-30.

<sup>162</sup> S. Stevin, *Huysbou*, 'Aenteijckeningen op Serlijns en anderen / Inhoudende sommige geschillen'; Cf. H. Stevin, 'Byvough', p. 112: '[...] om datse sorgelick sijn voor bevruchte vrouwen'.

<sup>163</sup> S. Stevin, *Huysbou* [VII-4], p. 335. Cf. H. Stevin, 'Byvough', p. 71: 'Ick versta oock 't ghene boven van den Heer eens Burgherlickx huys gheseydt is, plaets te houden voor den Vorst en Vorstinne, te weten dattet hemlien gerievich is, datse de camers bovenhaer slaepcamers, mitsgaders de kelders der deelen daer onder, hebben tot haer eyghen verdoen, mette de steegers soo veroirdent, dat sy in dat besonder ghedeelte mogen commen tottet bovenste en onderste vant huys, sonder van ymandt ghesien te wesen'.

<sup>164</sup> De Mare's 'A rule worth following in architecture?', p. 110, creates the impression with the remark 'An even more refined classification' that it is referring to a further filling-in of one and the same house. In actual fact the arguments she advances for explaining this 'domestic order' of the burgher house in terms of the man's rooms (as well as storage space for household effects) and in terms of the woman's rooms for storing linen, clothes and jewellery can be found in various passages of *Huysbou*; she draws no conclusion from this however. In *Huysbou*, [VII-4], p. 339, cf. *Materiae Politicae* p. 73, where the key system is discussed, there is indeed mention of the rooms of the 'Huysvrou'; it is obvious from the context, however, that this refers to a large urban palace rather than the burgher dwelling described in some detail on pp. 329, the content of which follows the description of the plan of a burgher house. Cf. *Materiae Politicae* pp. 66-67.

while women were allotted communal facilities. But in larger urban palaces and royal residences a twofold differentiation was maintained between privacy for men and privacy for women, and between these joint private apartments and the remaining communal and public rooms. However, this does not mean that Heidi de Mare's gender classification is in itself incorrect. Stevin implicitly acknowledged a difference in status between men and women, particularly in small private houses. But the design of Stevin's dwellings was not based on 'gender classifications'.<sup>165</sup> The relationship between male and female, or between private and public, differs in the small private dwelling from that of the larger, but Stevin organised all dwellings, whatever their level, on the principle of symmetry. This symmetrical layout of the different buildings was not derived from the differentiation between male and female, or between private and public; it was in itself the principle on which the divisions were based.

This is where Stevin's private house differs from that of Willem Goeree, whom De Mare has cited as a comparison. The terminology and subject in his *D'Algemeene Bouwkunde* (1681) suggest that Goeree must have been familiar with the posthumously published texts.<sup>166</sup> Goeree placed more emphasis than Stevin on themes such as the relative place of men and women in a dwelling, while not adopting Stevin's controversial, symmetrical layout. This makes it easier to answer De Mare's rhetorical point. While it is certainly worth exploring the role of gender in architecture, the key question is whether this architecture establishes a particular order or is itself conditioned by 'gender positions'. Stevin's house, certainly when compared to Goeree's, does not form a convincing example of the latter, and it is questionable whether this theory should really be treated as a serious alternative to the various explanations proposed so far. De Mare's reminder not to view Stevin through the eyes of modernist architecture is of course correct, but it is also superfluous. No writer to date has discussed the layout of Stevin's house in terms of 'form follows function'. Rational categories are legitimate as long as it is borne in mind that these had

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<sup>165</sup> In 'A rule worth following in architecture?', p. 120, De Mare appears to use the 'gender classification', both in the sense of confirming and instituting this order: '(re)establishment of gender positions in a new domestic setting'. At the outset of her discussion on 'Stevin's potential patriarchal intentions in architecture', p. 106, she uses Van Berkel's interpretation of Stevin as a 'technocraat die zich aan de heersende elite aanbiedt om haar belangen nog beter te behartigen' [technocrat who presents himself to the ruling elite, so as better to serve their interests], without including his qualifying remark 'ik overdrijf nu wat' [I exaggerate somewhat]; see Van Berkel, 'Annie Romein', p. 51. This statement is indeed too emphatic and too general. Stevin's architecture and town planning does generally affirm the ideas and standing of the ruling class; however, in the delicate question of the site of the citadel he compromised between the most advantageous choice for the sovereign and for the citizens.

<sup>166</sup> See also chapter 8.

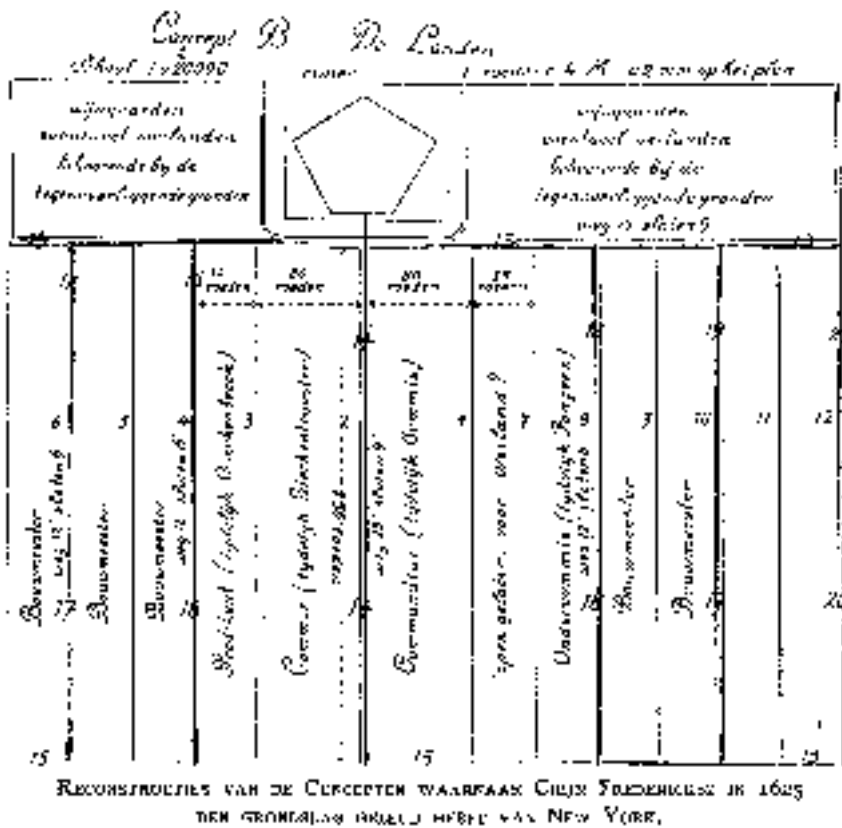
a different meaning in seventeenth-century architectural theory than they have in New Functionalism. In Stevin's case they offer a concrete term of reference; as an engineer he was accustomed to employing rational arguments, even if he was only partially successful in developing them in practice, as will become clear.<sup>167</sup>

Just as Stevin's house and town were made up of different components, so was the rationale on which he based them. Rather than employ a single rational system, he ordered functions on various levels according to various degrees of rationality. In his house, for example, Stevin based the logical arrangement of the rooms around a central courtyard on considerations of light and safety. But in most of these schemes, the functions which were meticulously worked out at other levels were not defined. In his town plan, the acentric placing of the palace offered a rational solution according to contemporary military theory, but this is not true of the fortification system. Like palaces, public facilities could be inserted anywhere since they were made of multiple blocks and formed a logical part of the layout. But the connections to the principal traffic routes appear less than optimal for a commercial centre. While the meat and fish markets lie adjacent to waterways, this is not true of the other five market places and the exchange. Stevin's double back-to-back dwellings – each with a courtyard between the front and back sections – offered a concrete solution to the long narrow dark houses with their unlit central rooms which were the product of the extended plots typical of many Dutch towns. Stevin's grid, however, bore little resemblance to the plans of most seventeenth-century Dutch towns. Although research into town plans overseas is still in its infancy, it is clear that the facilities Stevin envisaged far exceeded those needed at the earliest Dutch settlements, which at first often consisted of no more than a military camp or a trading post. Instead of emphasising the formal similarities between Stevin's town and colonial towns, a more productive area of research would be the possible connections between descriptions of the layout of military camps – as in Stevin's *Castrametatio*, for example – and the guidelines for overseas settlements. There is a remarkable similarity between Stevin's dis-

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<sup>167</sup> An important first step in the discussion of the development of a rationalist architecture was provided by A. Tzonis, *Towards a non-oppressive environment*, (Boston/New York 1972). In the first sentence Tzonis observes that 'Rationalistic architecture [...] is not characterised so because of its capacity to employ the rules of rationality, the rules of logic'. Although this remark is applicable in the general sense, it is my view, as I explain elsewhere, that the use of the rules of logic is in Stevin's case the most important key to understanding his architecture. In the Dutch translation of Tzonis's work entitled *Het architectonisch denken: Ontwerp, rationalisering van de architectuur en maatschappelijke macht*, (Nijmegen 1982), Stevin's town plan figures – without comment incidentally – in the chapter on 'Een bloem met een eeuwige jeugd' dealing with rationalist architecture.





Ill. 8 Reconstruction of drawing in the instructions (1625) of the West Indian Company to Crijn Fredericksz van Lobberecht in the *Van Rapparddocuments* by F.C. Wieder (1925)

course outlining a flexible method (see ill. 16) for setting up a camp on site and the instructions and schematic plan that Crijn Fredericksz took with him to New Netherland, explaining how to set up a trading post defended by a pentagonal fort, which formed the basis for the first plans for New Amsterdam in 1625, later to become New York (ill. 8).<sup>168</sup>

<sup>168</sup> F.C. Wieder, 'De Stichting van New York in juli 1625: Reconstructies en nieuwe gegevens ontleend aan de van Rapparddocuments', *Linschoten Vereeniging* 26, (The Hague 1925), plate 26, pp. 152-153. Batavia is regularly and incorrectly compared with Stevin's ideal town plan; for example, by B. Brommer, 'Oud Batavia gecarteerd. De eerste grote stadsplattegronden in de 17<sup>de</sup> eeuw', in: H.M. van den Berg (ed.), *De stenen droom: Opstellen over bouwkunst en monumentenzorg opgedragen aan Coenraad Liebrecht Temminck Groll*, (Zutphen 1988), p. 86 and idem, *Historische plattegronden van Nederlandse steden*, vol. 4, 'Batavia, [with Dirk de Vries]', (Alphen aan den Rijn 1992), p. 7. See also R. Raben's critique in 'Klein Holland in Azië. Ideologie en pragmatisme in de Nederlandse koloniale stedenbouw, 1600-1800', in *Leidschrift, Historisch Tijdschrift: De vierde dimensie. Stedenbouw in historisch perspectief*, (1992/93), no. 2, pp. 45-63 and K. Zandvliet's review of *Historische plattegronden van*

Furthermore, Stevin's square urban plots with their 360-foot sides are even larger than the ample plots of Amsterdam's ring of canals, conforming neither to the original urban structure nor with contemporary extensions.<sup>169</sup> Stevin's proposals for urban extensions were purely academic and bear no comparison with, for example, Salomon de Bray's suggestions for the extension of Haarlem.<sup>170</sup>

In short, from the perspective of the Dutch seventeenth-century house or town, Stevin's system lacked applicability. Which has radical consequences for those analyses of Stevin's system that focus purely on the practical side of his house and town layout.

### *House and town as experimental laboratory*

Although Stevin referred to architectural practice and town planning – and it is therefore hardly surprising that commentators have discussed his layout mainly in these terms – it should not be forgotten that Huysbou was originally intended for *Wisconstighe Gbedachtenissen*, 'inhoudende t'ghene daer hem in gheoeffent heeft den Doorluchtisten Hoochgeboren Vorst en de Heere Maurits' ('containing the exercises of the Illustrious Noble Sovereign Lord Maurice').<sup>171</sup> In its original form, *Huysbou* formed part of a work intended as an account of the scientific subjects and experiments that Stevin had set his pupil. Today, Stevin's references to Maurice's eagerness to learn may be dismissed as standard formulas; yet this didactic context is essential for an appreciation of the way the material was organised in this comprehensive work. It follows that Stevin's statements about order in *Huysbou* should not be understood in terms of whether his designs for the house and the town were practicable; the logic and clarity of the arguments underlying this order should also be taken into account. Whereas commentators have implicitly proceeded from the practical

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*Nederlandse steden*, vol 4, 'Batavia', in *Caert Thresoor*. (1994), no. 4, pp. 116-117. F. Westra, 'Lost and Found: Crijn Fredericx – A New York-Founder' *De Halve Maen*, LXXI, (1998), no 1, pp. 7-16.

<sup>169</sup> Cf. Van der Hoeven e.a., *Amsterdam als stedelijk bouwwerk*.

<sup>170</sup> S. de Bray, *Bedenckingen Over bet Uytleggen en Vergrooten der Stadt Haarlem*, (Haarlem 1661); see Taverne, *In 't land van belofte*, pp. 335-353. The idea put forward by Terwen and Ottenheim that Stevin advised that a large rectangle should be drawn within an irregular polygon, as was done by Post, among others, for the extension of Haarlem, is not entirely correct. Stevin proposed a cruciform extension, not a combination of a rectangle within a polygon. He did, however, make a drawing to illustrate the best method of defending a rectangular system of land division within polygonal ramparts (in actual fact a drawing of a rectangle with rounded corners), without expressing a preference for this form. The Hague, KB 128 A 9 II fol. 19v, plan. E. Hendrick did not include this plan in the printed version. See, J.J. Terwen and K.A. Ottenheim, *Pieter Post (1608-1669) Architect*, (Zutphen 1993), p. 221.

<sup>171</sup> S. Stevin, *Wisconstighe Gbedachtenissen*, 'Voorreden': '[...] inhoudende t'ghene daer hem in gheoeffent heeft den Doorluchtisten Hoochgeboren Vorst en de Heere Maurits'.

realisation of Stevin's dwellings and towns – despite using qualifications such as 'ideal' – his intention was in fact to produce simulation models for various practical situations. The main aim of these models was to explore suggested partial or total solutions, to give these a hypothetical form and test them, without immediately presenting a coherent and conclusive system to be directly translated into practice.

As already noted, Stevin was not interested in forms of towns and dwellings as compromises between the contrasting demands of military, economic or social orders. Instead, Stevin's writings on the layout of houses and towns are characterised by the separation of different levels and the segregation of adjacent functions. Stevin's synthesis of houses into blocks, blocks into towns and the ordering of urban extensions, focused more on the organisational method than on the precise form. And this method was governed by a single principle: that of mirror symmetry, to which all other organisational forms were subordinated.

It would be wrong to describe Stevin's emphasis on mirror symmetry as a mere technical appreciation of symmetry.<sup>172</sup> The desire to correct existing architectural theory on symmetry was prompted not only by a philological interest, it also stemmed from Stevin's more general – and more profound – ideas on science and scientific order. His ideas should be viewed within the context of Ramist notions of logic and the way these were introduced into the Republic at the close of the sixteenth century.<sup>173</sup> The emphasis that Petrus Ramus, and more especially his followers, laid on the analysis and imaginative depiction of the natural order through dichotomies is significant in terms of the importance that Stevin attached to mirror symmetry for architectural organisation. The concept of mirror symmetry and the use of dichotomies were already supposed to have prevailed in the Age of Sages. According to Stevin the ordering of scientific problems in terms of dichotomies derived from that time, through Plato's *Politica* and Aristotle's first book on 'Parts of Animals'. References to the latter are of particular interest since, despite the title, Aristotle regularly drew comparisons with the construction of houses. In his discourse on symmetry Stevin turned the metaphor around: 'The building must be like an animal or a bird, fish or crawling creature'.<sup>174</sup> Other passages

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<sup>172</sup> K. van Berkel, 'Spiegheing en Daet bij Beeckman en Stevin', in *Tijdschrift voor Geschiedenis, Geneeskunde, Natuurwetenschappen Wiskunde en Techniek* 2 (1979), pp. 89-100, p. 96 'For Stevin architectural beauty remained limited to a technical appreciation of symmetry'.

<sup>173</sup> On the relationship between Stevin and Ramus, particularly regarding mathematical methods, see Verdonk, 'Vom Einfluß des P. de la Ramée'. On the relationship between Stevin's architectural theory and Ramus see Van den Heuvel, 'Stevin et Ramus' and idem, *Papiere Bolwerken*, pp. 146-147.

<sup>174</sup> S. Stevin, *Huyssbou*, [i.1], p. 215: Cf. I. Beeckman 'Journael', folio 231r lines 36-37 '[...] 't gebou moet sijn gelijk een dier 't sij vogel, visch of cruijpende' [in margin: gelijkseydicheyt].

in Huysbou also contain frequent comparisons between well-ordered architecture and animals or the human figure.

Analogies such as these are even more significant in the light of Stevin's use of terminology from this book by Aristotle, applying the same metaphor of a house to illustrate a discourse on the structure of a scientific treatise on military science.

Like a person who proposes to build a house according to logic and rules, first considering the final cause (*causa finalis*) it is intended to serve, progressing from the house as a whole to its parts; but then having started the work, begins by making the parts that collectively form the whole incorrectly: thus it is my intention here to follow this order [...] whereby I shall start with the smallest elements.<sup>175</sup>

This combination of dichotomies and the house metaphor helps explain Stevin's emphasis on symmetry in architecture. A clear similarity exists between Stevin's layout of house, town and urban expansion from small to large – always according to the rules of symmetry drawn from nature – and his arrangement of scientific problems according to the 'natural order' of logic in increasingly intricate dichotomies. A dichotomy is of course not a random symmetrical order, but a 'division' of complementary conceptual elements. As has been shown, this also holds true of certain elements in Stevin's town, in which he cited the meat market opposite the fish market, the corn market opposite the cattle market and the wood market opposite the stone market. But it would be going too far to interpret Stevin's arrangement of house, town and urban extension in turn simply as one large dichotomy. It is more that an analogy exists between the order underlying these architectural phenomena and the structure of discourses on scientific problems. Just as Stevin regularly

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<sup>175</sup> H. Stevin, 'VIII Onderscheyt van de Crychspiegeling', in *Materiae Politicae: Burgberlicke Stoffen*, (Leiden 1649), p. 185: 'Ghelyck ymant diena reden en reghel een huys wil bouwen, eerst overdenkt de eintlicke oirsaeck\* [*causa finalis*] daert toe dienen sal, met een voortganck\* [*progressie*] vant heel huys totte delen; maer daer na ant werck vallende, verkeerdelick de deelen eerst maeckt, die t'samen het heel voortbrenghen: Alsoo is hier myn voornemen sulcke oirden te volghen [...] sal ick mette leeghste beginnen'; Compare 'Aristotle: Parts of Animals', in *The Complete Works of Aristotle*, ed. Jonathan Barnes, (Princeton 1984), p. 639, b 15-19 and 24-30: 'Plainly, however, that cause is the first which we call that for the sake of which. For this is the account of the thing, and the account forms the starting point, alike in the works of art and in works of nature. For the doctor and the builder define health or house, either by the intellect or by perception, and then proceed to give the account and the causes of each of the things they do and of why they should do it this.' And: 'For there is absolute necessity, manifested in eternal phenomena; and there is hypothetical necessity, manifested in everything that is produced by art be it a house or what it may. For if a house or other such final object is to be realised, it is necessary that first this and then that shall be produced and set in motion, and so in continuous succession, until the end is reached, for the sake of which each prior thing is produced and exists.'

employed the metaphor of a house when explaining the methodical arrangement of scientific questions, the converse – that scientific presentation models may have influenced his ideas on the order of architecture – cannot be ruled out. Indeed, contemporaries sometimes used the term dichotomy as an aesthetic concept, in lieu of symmetry. Isaac Beeckman, for example, when writing about the correct proportions of church spires in Rotterdam noted that ‘they are beautiful and agreeable to the eye: the dichotomy is pleasing’.<sup>176</sup>

Stevin organised each chapter or section of *Wisconstighe Ghedachtenissen*, as presumably he would have organised *Huysbou* if it had been included, into dichotomies, prefaced by an explanation of the central concepts. He also used a similar organisation for presenting his models of house, town and urban extension, prefacing each individual section with a description of the main components – the building blocks – combined according to the rules of mirror symmetry. This analogy with the ordering of a scientific problem goes some way to explaining the abstract character, but also the openness of his house, town and urban extension models.

In the foreword to *Wisconstighe Ghedachtenissen* Stevin cited as one of the reasons for publishing his exercises for Maurice:

So that those who notice mistakes [therein] will be able to correct these and add, for the common good, other, new inventions there for the greater benefit of those for whom it was written.<sup>177</sup>

Of course introductory remarks like this contain an element of rhetoric. Yet it is not unique in Stevin’s work and reflects his open-minded view of science. The material is presented as a momentary impression in a process of continual evolution and adaptation. Elements of a problem are solved, if only provisionally; eventually, the solutions may no longer be viable and may have to be replaced by better answers. This is familiar from Stevin’s presentation of the layout of a house, where he expressed his doubts whether his design would please everyone and whether he would always find it the most appropriate, while adding that, after extensive research, it was the best he could conceive at the time.<sup>178</sup>

Following this analogy through, it seems clear that Stevin’s scientific solutions and his organisation of architecture were only provisional. Yet despite

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<sup>176</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 348. See also here below note 371.

<sup>177</sup> S. Stevin, *Wisconstighe Ghedachtenissen*, ‘Voorreden’: ‘[...] sooder eenige sijn die daer in fauten mercken, dat sijse sullen meugen verbeteren, en ten gemeenen besten ander nieuwe vonden baer [sic ‘daer’] byvougten, streckende tot noch meerder vernoughen des geens daerse voor gheschreven sijn’.

<sup>178</sup> S. Stevin, *Huysbou* [VII-3], p. 321. Cf. H. Stevin, ‘Byvough’, p. 60.

this uncertainty, his presentations of scientific problems in general and that of the dwelling and the town in particular, were based on logical order. And in both cases this was derived from the Age of Sages when science and the arts had reached their apogee, when scientists presented problems in terms of lucid definitions and dichotomies and architects built according to the rules of mirror symmetry.

Stevin's designs for the private house, town and urban extensions can therefore be viewed in a new light. They were neither intended as a reaction to contemporary usage, nor as a blueprint for the future. Rather the illustrations of the house, the town and urban extensions were all models. Not to be slavishly followed, but to enable architectural questions to be analysed and visualised, and allowing solutions to be found for problems. These were simulations in which aspects of real life were imitated and the logical results of certain methods of organisation were taken to their logical conclusion. Their validity was limited since all the relevant factors had not yet been reviewed, nor had these constructions been placed in relation to each other. The central issue was not so much to determine the final result, but to demonstrate the method applied to test its practicability. The plans brought together a number of forms and functions on a purely provisional basis; when Stevin introduced new functions in specific ground plans this immediately altered the relationship between the individual parts. A symmetrical organisation on the lines of classical and Italian architectural treatises would be immediately destroyed since the relationships of the whole to the parts were all interconnected. Stevin was perfectly aware of this as is evident from a passage in the first chapter of *Huysbou* about the order of classical architecture:

It is true that just as each animal's members are well designed, so too the parts of buildings must be well designed, which is as much as to state that to design a building well, it must be well designed, this being simply a repetition of the principle we cannot deduce the knowledge we desire from it about the subject.<sup>179</sup>

Thus for Stevin the guiding principle was not the conformity of the measurements of the outlines in the various layouts, but whether the whole conformed to the principle of mirror symmetry.

Stevin's architectural design is therefore only rational to a point, despite being based on logical arguments. His ground plans only cover a few aspects of house, town and urban extensions, and are only partially related to each other. Yet although no coherent system exists, his models are nonetheless rational in

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<sup>179</sup> S. Stevin, *Huysbou*, [I-1], p. 211. Cf. H. Stevin, 'Onderscheyt van de Oirdeningh der Steden', pp. 14-15. Not originally part of the text on the town, but intended as a separate chapter of *Huysbou*.

the sense that they provide a lucid insight into architectural problems, dealing with them in a number of logical steps. In this sense Stevin's plans have a didactic function, rather than offering formulas for an ideal town with ideal public facilities and ideal private houses. They may have served as a tool for Stevin to illustrate certain problems of architecture and town planning to Maurice systematically and step by step. Logical and lucid models – albeit incomplete – were for Stevin a more appropriate means of achieving that goal than a complete reproduction of reality which, with all its contradictions, might obscure the problem, or in his own words, 'because the teaching should not be complicated by arguments'.<sup>180</sup>

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<sup>180</sup> The statement is taken from another work by Stevin in which the author left out the description of the proportions from his account of ground plans for didactic reasons; see Stevin, *Sterctenbouwing*, [p. 8], in *The Principal Works of Simon Stevin*, vol. IV, p. 67: 'op dat leering met gheen strijding verduystert en worde'.

### 3. Building methods and patents

*Like the futile expenditure of preparing a large, sturdy foundation to carry a heavy construction without in the end ever intending to place a building on it: so too reflecting on the principals of the arts is a waste of effort if the result fails to lead to action.*<sup>181</sup>

In *Materiae Politicae*, Hendrick Stevin had focused on publishing those fragments which dealt with the layout of house and town, leaving out a major section of *Huysbou* on the structural and civil-engineering aspects of architecture and town planning.<sup>182</sup> In fact his father frequently drew on the metaphor of building when discussing methods in science.<sup>183</sup> He also approached architecture as a scientific problem and believed that a thorough analysis of the methods, coupled with a knowledge of building techniques, would result in practical solutions which would not only create easier conditions for builders but also improve architecture.<sup>184</sup> Technical solutions and practical inventions were for Stevin the prime means of bridging the gulf between *spiegelbeling* and *daet* – between theory and practice.

Stevin's emphasis on crafts and building practice in his essay 'Vande vernieuwing des wysentijts' was not only intended to promote research into the correct terminology used in the building trade and to return the sciences to their former eminence, it was also aimed at acquiring supplementary information in areas where his own technical knowledge fell short. Observations in Beeckman's transcripts such as 'Plastering (says the plasterer) is made of a mixture of clay with calf hair and gathered hay [...] and something else (that the plasterer refused to divulge)' or 'I must ask the bricklayers if it would be good to use a very small quantity of mortar in the vaulting so it shrinks less' illustrate Stevin's aim to learn more about the technical mysteries of the building trade before making any theoretical statements.<sup>185</sup>

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<sup>181</sup> S. Stevin, *Weeghdaet*, I, p. 292: 'Gelijck onnutte cost waer een groote stercke grondt te leghen, die een swaer ghesticht draghen can sonder eintlick eenich ghebau daer op te willen brenghen: Alsoo is de spiegelhelingh in de beghinselen der consten verloren arbeyt daer t'einde totte daet niet en strect.'

<sup>182</sup> See also the introduction and second part, below, pp. 159 and 493.

<sup>183</sup> See chapter 1, above, pp. 30ff.

<sup>184</sup> See also, Van den Heuvel, 'Stevins "Huysbou"'.

<sup>185</sup> S. Stevin, *Huysbou*, [v-2] p. 283 and Verscheyden aenteyckeningen, Van Metselarye, p. 399, Cf. I. Beeckman 'Journael', folio 232r. lines 20-21 and folio 226v. lines 29-31. De Waard assumes that the second statement is by Beeckman and not by Stevin and places it elsewhere in his transcript;



But these pieces of practical advice on the application of building methods which Stevin collected for his architectural treatise are not always easy to combine with his theoretical, relatively abstract descriptions of the house and town. In terms of dwellings, Stevin only explored a few technical matters in detail in the chapters on ‘underground works’, façades, attics and roofs; many problems were left scattered in his ‘Verscheyden Anteyckeningen’ (‘Various notes’).

The varying degree of abstraction with which Stevin presented these examples of technical inventions is striking. Some are speculative while in others a minor subject is worked out in meticulous detail. Stevin’s description of a water tank (see ill. 28), for example, is so detailed that even the dovetail joints of the wooden frame for the heavy tank are mentioned. In contrast he illustrated the principle of *santsypen* – purifying water by filtering it through sand – with several theoretical variations supported by schematic drawings (see ill. 29) reminiscent of physics lessons on communicating vessels. This contrast is also typical of the passage on drilling wells, discussed below, in which Stevin gave a meticulously detailed description of the drill and all its parts, while only providing a relatively general scientific account of the methods of drilling.

The various technical questions addressed in the other chapters of *Huysbou* reflect an interest in structural aspects and the use of building materials in different circumstances.

Although almost all the actual texts of the discussion on the *freyten der gevels* (buttresses of façades) are missing, it may be assumed that Stevin was principally concerned in this section with ways of supporting and tying the façade. Illustrations and observations in Beeckman’s transcript reveal Stevin’s interest in the load capacity of beams and the distribution of forces in arches and spandrels in ceilings and roofs. It is striking that Stevin broached these technical questions in places where they would be least expected. While Stevin casually noted his preference for cross-windows in one part of *Huysbou*, in the section on façades he went into detail about the best way of inserting window frames into the façade so as to minimise the risk of draughts and of leakage, as well as enlarging on the advantage of shutters as a protection against burglars and

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cf. De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 297, p. 395 and p. 398. However, his reasoning is not convincing. Moreover, the first statement – which De Waard leaves in place – also shows that Stevin was interested in what craftsmen had to say. For the significance of this quotation concerning ‘pleysteringh’ for the practice of plastering, see W.F.J. Freling, *Stucwerk in het Nederlandse woonhuis uit de 17<sup>e</sup> en 18<sup>e</sup> eeuw*, (Leeuwarden/Mechelen 1993). Other transcripts of *Huysbou* also confirm that Stevin personally sought the advice of craftsmen: S. Stevin, *Huysbou*, [VI-1], p. 293. Cf. H. Stevin, ‘Byvough’, p. 100: ‘Maer om nu te seggen welke wyse van alle dese ick voor de beste houde, soo is voor eerst te weten dat als de gene die in Hollandt huysen willen bouwen, van daken raet vragen aen Timmerliën, Pandeckers en Panbackers’.

on the best way of opening these. The latter is particularly interesting since this represents the first description of the principle of the sash-window in architectural theory. Although these probably existed before, the earliest known examples date from buildings of the second half of the seventeenth century. Stevin's preference for a system in which the lower half slides down and the upper half up – thus distributing the weight as evenly as possible – reflects an engineer's interest in the mechanical aspects of the sash-window.<sup>186</sup>

When addressing the technical aspects of cellars, ceilings and roofing Stevin dealt mainly with the choice and use of building materials, such as the use of clinker and trass. He also touched on the use of moss and tar for keeping underground spaces dry, as well as on the plastering of ceilings as a fire precaution and the advantages and disadvantages of various types of roof tiles and slates in different weather conditions.

Similar technical problems also crop up in 'Verscheyden Anteyckeningen' – loose notes which nevertheless provide an interesting supplement to Stevin's architectural theory. These examine the structural use of building materials, as well as the properties of the materials themselves, the best method of working them and alternative uses. On the properties of building materials Stevin noted that 'Tournai limestone is the best because it adheres firmly to the stone [...] But Leiden limestone being made of burnt shells, produces damp walls due to the salt',<sup>187</sup> while the remark that 'Clinker cannot be cut but may be shaped' reveals something of the ways of working these materials.<sup>188</sup> Questions such as 'Would clinker be good in façades?' suggest that Stevin was interested in alternative uses of materials to help advance building methods.<sup>189</sup> Exactly how

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<sup>186</sup> The origin of the sash window is debatable, being attributed both to England and France. See for this, H. Janse, *Vensters*, (Nijmegen 1971), H.J. Zantkuijl, 'Het schuifraam', in *Bouwen in Amsterdam*, 24 (1980), pp. 210-220, esp. 210-211 and H.J. Louw, 'The origin of the sash window', *Architectural History*, volume 26 (1983), pp. 49-72. I am indebted to R. Meischke for the information that a number of Hans Vredeman de Vries's architectural drawings may depict sash windows. While this may be so, Vredeman de Vries does not enlarge on the principle applied. Louw (p. 56) points out that even in Willem Goeree's much later treatise on architecture, *D'Algemeene Bouwkunde Volgens d'Antyke en Hedendaagse Manier, door een beknopte inleiding afgeschetst, en van veel onvoegsame bewindselen en verbasteringen ontswageld en verbeterd*, (Amsterdam 1681), which discusses windows in great detail, (pp. 165-166 and 169), the sash window is not mentioned.

<sup>187</sup> S. Stevin, *Huysbou*, Verscheyden anteyckeningen, Van Metselarye, p. 399; Cf. I. Beeckman 'Journael', folio 227r. lines 14-18; 'Doornixe calck is de beste, omdat hetaen de steen harde vereenicht [...] Maer Leydts calck, gemaectt zyne van gebrande zeeschelpen maeckt vochtige muyren om de souticheytswille'

<sup>188</sup> S. Stevin, *Huysbou*, Verscheyden anteyckeningen, Van Metselarye, p. 397; Cf. I. Beeckman 'Journael', folio 227r. lines 19-21.

<sup>189</sup> S. Stevin, *Huysbou*, Verscheyden anteyckeningen, Van Metselarye, p. 397; Cf. I. Beeckman 'Journael', folio 225v. lines 9-14. De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 297 assumes that

alternative these uses were is illustrated by a formula Stevin provided for a paste made by ‘skimming the surface of buttermilk with a spoon’ for filling up a crack in the trass.<sup>190</sup> Special attention was also directed to methods for counteracting the damaging effects of northern climatic conditions on building materials.<sup>191</sup> Stevin’s interest in the practical and often local problems of the building industry was coupled with a concern for more general theoretical issues which might have important consequences for architecture. Beeckman’s manuscript contains various discussions of mechanics which Stevin had intended to include in his *Huysbou*. Statements such as: ‘When joined, wood is stronger than when separate, as was shown when I hung weights on two sticks until they broke. I saw that much more than twice the weight could be hung from the whole timber than from the cut [timber]’ and ‘I must investigate why round vaulted ceilings, as in baker’s ovens, are so strong despite being so flat’<sup>192</sup> reveal that Stevin was not content to rely simply on the opinion of experienced architects, but carried out his own experiments and research to explain certain static forces in architecture. Stevin hoped that a scientific study of certain architectural properties would lead to a set of rules which could be generally applied to building practice.

### *Patents*

The patent proved a decisive element in the process from scientific experiment to practical application. Indeed, patents were an official recognition that the research was not only original, but also of value to society. Stevin was closely involved in the development of patents, as an arbitrator in applications submitted to the States General and on a few occasions as an advisor to this body on patent applications.<sup>193</sup> Stevin himself was granted patents for at least

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this last statement is by Beeckman and therefore moves it to his publication of Beeckman’s transcript. In fact the fragment is found in fol. 225v, line 10.

<sup>190</sup> S. Stevin, *Huysbou*, Verscheyden aenteyckeningen, Van Metselarye, p. 399; cf. I. Beeckman ‘Journael’, folio 226v. lines 24-28.

<sup>191</sup> S. Stevin, *Huysbou*, Verscheyden aenteyckeningen, Van Metselarye, p. 401; cf. I. Beeckman ‘Journael’, folio 226v. lines 18-23.

<sup>192</sup> S. Stevin, *Huysbou*, [v-3], p. 289 cf. I. Beeckman ‘Journael’, folio 232r. lines 20-21 ‘Ick moet ondersoucken waarom ronde overwelfsels, als brootovens, soo sterck syn, nochtans sooseer pladt wesende’.

<sup>193</sup> For Stevin’s arbitration in a patent application submitted by Adam de Vries of 1613 concerning an ‘inrichting om aanslibbing te bevorderen’ [a method for furthering land accretion], see G. Doorman, *Octrooien voor uitvindingen in de Nederlanden uit de 16-18 eeuw*, (The Hague 1940), p. 124, G 123. For Stevin’s participation in an advisory committee set up by the States General to assess Jarich’s new method of calculating longitude at sea, see F. Westra, ‘Jan Pietersz Dou (1573-1635): Invloedrijk

fifteen different inventions.<sup>194</sup> He developed five different types of drainage mills, two methods of transporting ships through shallow water, various ways of draining and purifying water, devices for dredging and removing the resulting mud, as well as a multifunctional mechanism that not only drove a turnspit but rocked a baby's cradle as well. With the exception of the latter, these were all large-scale, civil-engineering inventions which were often of considerable importance to the town. The inventions for dredging waterways or, where that was not possible, for transporting ships through shallow water or lifting them over dams could be crucial to the welfare of a town. If channels leading into a town were impeded by banks in front of harbours, or other obstacles in the waterways, there was a danger that trading partners might look to rival centres to avoid difficult and costly transshipment operations.<sup>195</sup> The mills, pumps and other machines that Stevin devised for regulating and purifying water benefited the town and served public welfare. It is known that the water mills – for which Stevin and Johan Cornets de Groot, father of Hugo de Groot, were granted joint patents in 1586 and 1588 – were used in the city of Delft to scour the moats, ditches and canals and to stimulate the flow of foul stagnant water. Furthermore, some of the other nine inventions for which Stevin was granted patents the following year were also adopted in the town's public works. His dredging machine (see ill. 2) was used to dig out Danzig harbour and his *slootbosser* (ditch bailer) (ill. 9) was tried out in Leiden. In his application for a patent for this particular invention, Stevin proudly claimed that when the invention was tested it had taken six men the same amount of time to draw the same quantity of water out of Rapenburg canal as three horses.

The importance of these inventions for the town encouraged architects to become involved in experiments relating to different areas of the building trade, civil engineering and other structural works, as well as producing designs for actual commissions.<sup>196</sup> Patents could be lucrative and architects were not

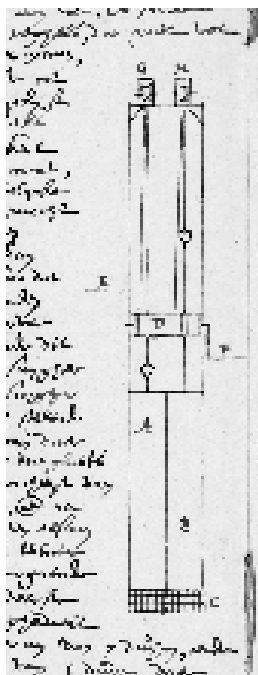
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landmeter van Rijnland', in *Caert Thresoor*, vol. 13, (1994), no. 2, pp. 37-48, esp. 39, for the resolutions of 1 November 1617 and of 29 December 1618. Morren (see note below) points to other resolutions such as that of 5 January 1619, fol. 10v. (original Admiralty file 1619) and of 23 November 1619, fol. 1651.

<sup>194</sup> The Hague, 4 VTHR 4795E "verscheijden inventien van Simon Stevin". See also R.J. Forbes in *The Principal Works of Simon Stevin*, vol. v, (Amsterdam 1966), p. 9-38. See also, in the Gemeente-archief in The Hague, the former Morren file, now part of section OV2 Personalia 718 Stevin.

<sup>195</sup> For this problem, see J.J. Sigmond, *Nederlandse zeehavens tussen 1500 en 1800*, (Amsterdam 1989).

<sup>196</sup> It is known that Hendrik de Keyser and Hendrick Jacobz Staets were both granted patents in 1596 for two different versions of a so-called 'oorgat', a hinged, raisable plank in the road surface of a bridge which would allow a ship to pass underneath without lowering its mast. W.H. Drucker, *Handboek voor de studie van het Nederlands octrooirecht*, (The Hague 1924), p. 66. For the complete text: E.F. Kossmann, 'Hendrik de Keyser als uitvinder', in *Oud Holland*, (1929), pp. 284-288. See also,



Ill. 9 Ditch bailer (“sloothoser”) tested in the Rapenburg canal of Leiden. Patent of the States-General (1589). The Hague, Nationaal Archief, VTHR 4795E

alone in devising inventions to improve the home and the town. Professionals from widely divergent fields experimented with the most unusual ways of applying existing technology. The physician Peutius was granted a patent in 1597 for a new type of pitch for preserving wood and cables, likewise his colleague, the surgeon Adraen Sare Roomen in 1613 for a product that preserved ships’ hulls. And in 1618 a patent was granted for a similar material to be used in houses for sealing roofs.<sup>197</sup> Stevin may have been referring to these patents for alternative applications when he wrote in the annotations to *Huysbou*:

The second method was recently used in Amsterdam where the ground is low: caulking the part that remains below water with wood and preserving it with moss and tar as with ships.<sup>198</sup>

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Doorman, *Octrooien voor uitvindingen*, G 29 and G 39. R. Meischke, ‘Het Amsterdams fabrieksambt van 1595-1625’, in *Bulletin van de Koninklijke Nederlandse Oudbeidkundige Bond*, (1994)-3, pp. 100-122, esp. 102. poses the question whether De Keyser and Staets were in competition with each other for this patent or whether they were both tackling an urgent problem, especially in Amsterdam. A combination of both is of course also perfectly possible.

<sup>197</sup> Doorman, *Octrooien voor uitvindingen*, p. 97, G 34, p. 124, G 126 and p. 139, G.169.

<sup>198</sup> S. Stevin, *Huysbou*, [II-5], p. 255, cf. H. Stevin, ‘Byvough’, p. 97.

Apart from mentioning contemporary architectural experiments in *Huysbou*, Stevin also found ways of incorporating his own experiments into his architectural theory.<sup>199</sup> The chapter ‘Hoemen t’water van stilstaende stinckende grachten can ververschen’ (‘How to refresh the water in foul stagnant canals’), for example, is based on experiments carried out in the canals of Delft and in Rapenburg in Leiden. Unfortunately, in his architectural treatise Stevin did not expand on the machine used to convey the water from the clean, deepened section of the canal into the dirty stagnant water to refresh it. Nevertheless, the remark that it was possible, on the basis of his calculations, to work out how many men and horses would be needed to refresh the water in a canal in a specific period, would seem to tie in with the patent application and it seems probable that the machine used was indeed the ditch bailer.<sup>200</sup>

According to the patent description, the invention could be used not only for sluicing out canals and other waterways but for spring waters as well. This is interesting in connection with the description of an invention that Stevin intended to include in *Huysbou*, which relates to a drilling method used in June and July of 1605 in Amsterdam to dig a well deep into the ground to draw up drinking water from beneath the brackish bed.<sup>201</sup> Hendrick Stevin referred in this connection to ‘Van de schrijvers vont diep onder water ter booren’ (‘On the writer’s invention of drilling deep under the water’). In fact the invention used for drilling in Amsterdam was devised by Pieter Pietersz Enten who was granted a patent in 1602 by the States General ‘for the instruments and means to furnish the aforementioned (the low lands in Holland) with good wells and suitable water’.<sup>202</sup> Hendrick Stevin’s *Materiae Politicae* contains a description of the drilling. Huygens’s manuscripts, however, offer much greater detail, with a list of questions and answers on the actual drilling process, as well as illustrated descriptions, ‘Van de gedaente des boors’ (‘On the shape of the drill’) and ‘Manier van booren’ (‘Method of drilling’).<sup>203</sup>

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<sup>199</sup> The inclusion of contemporary inventions in architectural treatises was not unique. Hans Vredeman de Vries, for example, included an illustration of an earlier variant of the above-mentioned ‘oorgat’ in his *Architectura* fol. 4. See also, Van den Heuvel, ‘Stevin’s “Huysbou”’, pp. 12–14.

<sup>200</sup> S. Stevin, *Huysbou*, [VIII-4], p. 387; H. Stevin, ‘Eenighe stucken der Crychconst; Beschreven deur Simon Stevin’, KB 128 A-9 II, fol. 14r-15r for the description of the ‘machine’ for refreshing canal water.

<sup>201</sup> Stevin provided another, illustrated, explanation as to why a deeper well did not necessarily produce better quality groundwater. Cf. S. Stevin, *Huysbou*, [II-2], p. 239, cf. H. Stevin, ‘Byvough’, pp. 127–128.

<sup>202</sup> ‘[...] voor instrumenten ende middelen daermede hy deselve (die laege landen in hollant) souden mogen voorsien van goede putten ende bequam water’; Doorman, *Octrooien voor uitvindingen*, p. 107, (G. 68). Design for patent: The Hague, 4 VTHR 4795A.

<sup>203</sup> Huygens, ‘Manuscripts’ (Adversaria), fol. 146r-148r. See also S. Stevin, *Huysbou*, II, 2, p. 235.

A correspondence between Constantijn Huygens and the renowned French Minorite scholar Marin Mersenne places this supplementary information into context. In 1639 Mersenne wrote to Huygens asking for information about the use of wells and pumps in Holland. In his letter of 1 April 1640 Huygens answered with some pride that a drilling method was already in use in his country which could draw up good water from deep under the ground, even in cities such as Amsterdam and Leiden where it was necessary to drill down to enormous depths. In this letter Huygens referred to some of Stevin's unpublished texts that he possessed in which the latter referred to these drills as the finest invention since antiquity.<sup>294</sup> Mersenne was so interested that he immediately sent Huygens an extensive list of questions about the method. Huygens dispatched an envoy to put the questions to a certain Job Adams, 'well driller' of Amsterdam. Adams was the son of the then deceased farmer and inventor and great-nephew of Pieter Pietersz Enten who had successfully carried out the drilling at the Oudemannenhuis old-age home in Amsterdam 35 years previously. The questions and answers, with accompanying commentary, were translated into French by Huygens and sent to Mersenne on 3 June 1640. Huygens's answer also included new and detailed drawings (see ill. 25-26) of the drill. Both the questions and the drawings in this letter correspond in large measure to the descriptions and illustrations in Huygens's manuscripts. The questions themselves are definitely in Huygens's handwriting from which it may be concluded that this is the original list which he had sent to Job Adams.

Huygens was rather shocked by Job Adams's somewhat unscientific answers and pointed to discrepancies with Simon Stevin's work. Adams, for example, had referred to the trouble caused by 'quicksand' when drilling, which showed that the artisan was obviously unaware of the use of water pressure as a means of overcoming this problem. On the other hand, the description of the drilling method in Huygens's 'Adversaria' reveals that the exceptional aspect of this 'miraculous invention' lay precisely in the fact that the drilled hole always remained full of water. The outward pressure of this cylinder of water against the walls of the well not only prevented it from collapsing, it also stopped the drill and the well from clogging up with sand. Job Adams, as a well-driller, was undoubtedly acquainted with this particular drilling method and probably used the same type of drill used by his father and great-uncle for drilling 232 feet down into the ground at Amsterdam's Oudemannenhuis. So he had no reason to conceal the origin of this efficient drilling method. It seems more probable that Stevin wished to propose drilling as practical proof

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<sup>294</sup> De Waard (ed.), *Correspondance du P. Marin Mersenne*, vol. VIII, letter dated 26 August 1639, pp. 490-495, esp. 493, and vol. IX, letter dated 1 April 1640, pp. 257-261 and 3 June 1640, pp. 378-384. For this statement, p. 259.

of his previously expounded theories and therefore presented the method as favourably as possible.<sup>205</sup> Stevin may have wished to elaborate on the method; in the discourses on the form of drills and method of drilling in Huygens's manuscripts, the descriptions of the events at Oudemannenhuis have become entangled with Stevin's own ideas. It is also possible that Stevin considered submitting an application for a patent for an improved method. Indeed his son spoke 'of the writer's invention for drilling deep under the water', and the drawing of the drill in 'Adversaria' is clearly different from the instrument scribbled by Huygens in the margin of his first letter to Mersenne to illustrate the drilling at Oudemannenhuis. This was obviously a method whose advantages were generally recognised, but which still required some adjustment in practice. Enten must have felt threatened by competition because in 1613, the year in which his patent was due to lapse, he produced a witness to reaffirm under oath that in 1602 he had reached a depth of 100 feet with his drill.<sup>206</sup> And although there is no evidence in the registry of patent applications of this patent being granted an extension, it may be assumed that it was, since in 1622 Enten was still drilling wells in Amsterdam.<sup>207</sup> If Stevin did apply for a patent on the basis of the drawing of this instrument, it was probably not granted because it was too similar to the patented design. Nonetheless, Stevin's description became well-known both nationally and internationally. Apart from the description based on the correspondence that Mersenne included in his 'Hydraulica Pneumatica', in 1663, some sixty years after the drilling in Amsterdam, Christian Huygens gave a lecture on the subject, probably based on his father's annotations, shortly before being admitted to the Royal Society in London.<sup>208</sup>

From all this it is clear that Stevin had a particular interest in building methods, both for the private house and the town. With regard to the house his interest was practical, embracing the properties and choice of materials, the effects of climatological conditions, as well as structural aspects relating to different parts of the building. Alongside this focus on practical aspects of

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<sup>205</sup> Stevin had previously expounded this principle in his *De Beghinselen des Waterwichts*, (Leiden 1586). A more detailed explanation appeared in 'Van de weegconst', the fourth part of *Wisconstige Gheachtenissen*.

<sup>206</sup> J.G. van Dillen, 'Bronnen tot de geschiedenis van het bedrijfsleven en het gildewezen van Amsterdam II', *RGP*, 78, p. 33, no. 64.

<sup>207</sup> Van Dillen, 'Bronnen', p. 463, no. 805.

<sup>208</sup> M. Mersenne, *Cogitata, physio mathematica*, (Paris 1644), *Hydraulica, Pneumatica, Arsque navigandi, Harmonia theorica, practica et Mechanica phenomena Prop. 53*; *Fontes et puteos invenire et cisternas construere*, pp. 217, 221; D. Bierens de Haan, J. Bosscha e.a. (eds), *Oeuvres complètes de Christiaan Huygens*, 23 vols. (The Hague 1888-1950), vol. xxii, pp. 270, 272.



building, for which he sought the advice of experienced professionals, Stevin was also interested on a theoretical level as a scientist, wishing to devise practical solutions based on established scientific principles. This interest is especially reflected in the patents for inventions for drainage mills, pumps and other machines for controlling the water in and around towns. Yet Stevin only managed to incorporate a few of his ideas on building methods in *Huysbou*. Although he did focus on construction and the use of building materials in several chapters on cellars, façades, attics and roofs, he generally limited his observations on the properties of the materials themselves, alternative formulas and the technical background of building structures to individual annotations. The same was true, although to a lesser extent, of his descriptions of hydraulic and civil-engineering inventions.

It is possible that the variety of technical issues, as well as the different levels of abstraction with which these problems were tackled, precluded their inclusion in *Huysbou*. The majority of the technical inventions, which have survived in a coherent form from various fragments of the architectural treatise and from patent applications, had already been proven before Stevin published his *Wisconstighe Ghedachtenissen*. When Stevin formed the idea of presenting a number of these inventions in a separate publication on drainage mills is not known, but it is clear that some of these texts were closely related to themes he was planning to address in his architectural treatise. Stevin's son obviously considered the relevance great enough to warrant the addition of 'Weechdadelicken Handel van Cammen en Staven in Watermolens' and 'Cleytrecking' to *Huysbou*. Moreover, the descriptions of the inventions often form isolated entities, possibly because they were set out as individual patent applications and therefore difficult to assimilate into the architectural treatise. Yet, although Stevin did not manage to incorporate all his ideas on building methods and the descriptions of his hydraulic, mechanical and civil-engineering inventions in his architectural treatise, these aspects nonetheless indirectly contributed to his international fame.

## 4. Water: ally and adversary

[...] *the continual practice these countries have with the water* <sup>209</sup>

It is hardly surprising that water should play a key role in Stevin's attempts to bring scientific theory into line with practice and, more specifically, in his adaptation of architectural principles to circumstances in the Low Countries. In the dedication to the States General in one of his early works, *Beghinselen des Waterwichts* of 1586, Stevin had already drawn attention to the profit the Dutch could derive from his observations on water:

Since it is sufficiently known, Your Worship, what continual practice these countries have with the water, more so than any others; from which it also appears of what greater profit the knowledge about the causes of the statical properties of water may achieve.<sup>210</sup>

This largely theoretical discourse was intended to be followed by a description of some concrete examples. Although this never went beyond the brief 'Anhang der Waterwichtdaet' ('On the practical applications of hydrostatics'), references to the subject appeared in other manuscripts by Stevin, including *Huysbou*.

Hendrick Stevin's commentary reveals that in 1605 – by which time his father had already selected what was to be published in *Wisconstighe Gbedachtenissen* – numerous texts dealing with water were earmarked for *Huysbou*. The passages that Stevin incorporated into 'Eertclootschrift' and later in *Nieuwe Maniere van Sterctebou door Spilshuysen* were taken from various sections of the chapter 'Vande oirdeningh der steden', particularly from the paragraph on water-scouring. The preface to 'xi Boec Van Den Handel Der Waterschuyring Onses Vaders' in *Wisconstich Filosofisch Bedryf* reveals the rudiments of Stevin's

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<sup>209</sup> S. Stevin, *De Beghinselen des Waterwichts beschreven duer Simon Stevin van Brugghe*, [Leiden 1586; p. 3], in *The Principal Works of Simon Stevin*, vol. 1, (Amsterdam 1955), p. 381: '[...] de gheduerighe oefning die dese landen met het water hebben'.

<sup>210</sup> Ibid.: 'Anghesien kennelick ghenouch, is E. Heeren, de gheduerighe oefning die dese landen mettet water hebben, meer als ander; waer in oock blijckelick is, wat grooter voordeel hun de oirsaeckelicke kennis der wichtige ghedaenten des waters doen can'.

unfinished architectural treatise in his forthright warning of the impact that unconstrained nature could have on the built environment:

Some people, seeing the extraordinary power of the sea and large rivers, take this on the whole to be God's work, about which men trouble themselves in vain. To which we say that it is evident that all is God's work, but it is useless to believe too simply that men trouble about this in vain, for they sometimes divert the course of large rivers, e.g. by making a cut, by building piers, and similar skilful actions. One man alone (to mention alone a few instances) by cutting a dyke can turn a fertile, cultivated and built-up land into a full sea within a few hours. Large areas are embanked, dammed, strengthened, rendered fertile, and inhabited by the hand of men, over which areas in other circumstances the high waters would flow, laying them waste.

The study of the causes of these things thus not being a useless trouble, as some people believe by an excessive generalisation, we may with reason pursue this study as much as seems suitable.<sup>211</sup>

Clearly, Stevin was not prepared to simply submit to the forces of nature and was convinced that scientific research into the ways that water affected the Dutch coast and rivers could help control the danger to life and property.

Stevin's dismissal as an 'excessive generalisation' of the notion that people should not interfere with God's creation demonstrates his rejection of fatalism, while his impatience with centuries of received wisdom is reflected in his criticism of the view that a simple incision could effect sufficient scouring to form good waterways and canals. Stevin defined the problem further by analysing the scouring resulting from different types of watercourses. Using diagrams, he illustrated the scouring effect of the ebb and flow of tidal rivers, with and without locks, and in different geographical situations, both on the coast and inland. This was the first attempt to develop a series of standard solutions to a variety of situations, each with their own characteristics.

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<sup>211</sup> H. Stevin, 'Vanden handel der Waterschuyrc', [fol. 37], in *The Principal Works of Simon Stevin*, vol. v, p. 204: 'Sommige ansiende de seltsame geweld der Zee en groote Rivieren houden sulcx als deur gemeene regel voor Godts werck, daer de menschen te vergeefs hun onbecommeren. Waer opgeseyt wort, dat alles Godts werc te wesen openbaer is, maer al te eenvoudelic te gelooven, dat de menschen hun daer me te vergeefs becommeren, is onnut, want sy doen somwylen groote Rivieren haer loop veranderen, als met yet deur te graven, hoofden te leggen diergelijcke behendigheden: Een mensche alleen (ic laet veel varen) can met een dyc deur te steken, maken dat op weynig uren een vrugtbaer bewassen, betimmert lant, verandert in een volle zee: groote Lantschappen worden deur menschen handen bedyckt, bedampt, becribt, vruchtbaer gemaect en bewoont, daer anders de hooge wateren over soude loopen, die verwoestende. De ondersoeking dan der oirsaken deser dingen niet sulke onnutte becommering wesende, gelijc sommige deur al te gemene regel meynen; Wy meugen met reden ons daer in oeffenen so veel als oirboir schynt.'

In the preface, Stevin referred in general terms to the importance of research on the effects of water on the landscape. But he placed more emphasis on this interrelationship in his introduction to the selection of passages from *Huysbou* for his geographical work, 'Eertclootschrift':

After which, his Royal Grace having soon become well-acquainted with the famous origins of the art of building, and with fortification: he had seen what kind of difficulties occur here, from works that subside and collapse due to poor ground; and where they meet the current, how they are swept away at high water, how the canals silt and clog up. In several places it proved impossible to achieve sufficient depth in the canals due to the upsurge of the sand, nor were the piles able to reach the required depth in the quicksand. Furthermore, he saw how, when some harbours silted up with sand or slurry, attempts at improvement costing massive sums sometimes worsened the situation, and that this or that council would often be divided in the face of the aforementioned misfortunes, unable to find any firm common ground, so that often, moreover, the wasted costs could contribute to the nation's uncertain situation. Now, whenever, in the course of time, I came across such tribulations, I started to investigate the causes, continually noting everything that might serve and seemed relevant to the case.<sup>212</sup>

Instead of confining his comments to neutral remarks about research into ways of controlling the forces of nature that threatened the man-made landscape, Stevin pointed out various dangers that would arise if God's creation were allowed to run its course.

Clearly, Maurice was so convinced by Stevin's description of the problems of building on Dutch ground – the erosion of buildings, subsidence, the silting-up of canals and the welling-up of quicksand when driving in piles – that he ordered an immediate examination into their causes. Stevin added his initial findings to his annotations for *Huysbou*, but he soon decided – apparently on

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<sup>212</sup> S. Stevin, *Wisconstige Ghedachtenissen*, 'Tweede Bouck des Eertclootschrift Vant Stofroersel des Eertcloots', p. 51: 'Nadien sijn Vorstelicke Ghenade hadde de Bouconstens vermaerde afcomst\* [speciem] de Huysbou\* [Architecturam], en daerbenevens hem in de Sterctebou\* [en la fortification] dadelick seer geoeffent: Soo heeft hij gesien wat swaricheden daer in te vooren comen, van wercken die deur qua gront insincken en omvallen: En daer stroom teghen comt, hoese met hooghe wateren afspoelen, de grachten versanden, en verstemmen. Tot ettelicke plaetsen en conde men in de grachten gheen behoirlicke diepte krijghen, om de opwelling vant sandt: De heypalen en conden oock dickwils int welsandt tot gheen begheerde diepte gheraken. Sach voort dat sommige havens versanden, of met slijck vervulden, welcke men meenende te verbeteren, na groote cost somwijlen vererghert waren, en dat den Raet van d'een en d'ander teghen de boveschreven onghewallen, dickwils seer verscheyden viel, sonder op eenighe gemeene seker gront gelet te worden, streckende dickwils benefens verloren kosten tot onsekerheyt des lands. Nu alsoo my over een tijt dergelijcke swaricheden ontmoet hadden, ick begaf mij tottet ondersoucken der oirsaken, allenx alsnu alsdan opteyckenende al t' gene my totte saek docht te dienen, en vast te gaens'.

Maurice's advice – to present this as part of 'Eertclootschrift'. This decision might have been prompted by the fact that the architectural treatise was as yet too insubstantial to be included in *Wisconstighe Ghedachtenissen*. Either way, Stevin advanced detailed arguments why the work should not form part of his treatise on architecture: the phenomena described were not caused by human forces and the conclusions to be drawn from their interpretation would go beyond *Huysbou's* terms.<sup>213</sup>

It seems that Stevin was moving away from the notion expressed in the preface to 'Waterschuyring' that a knowledge of the natural processes of God's creation – however hard to fathom – was essential for the safety of the built and inhabited environment. A closer examination of the text of 'Eertclootschrift' reveals that, for Stevin, the boundary between geography and architecture was no longer clear-cut: this discourse on geography contains something of the legacy of *Huysbou*.

One of the first issues in which the dilemma between submission to the forces of nature and attempting to control these occurs is a description of land accretion.

Namely that in Holland land owners are often in a state of doubt and disagreement regarding such accretions, whether to continue building dykes or to wait a few years until a larger surface and higher clay has accumulated, because in many places major changes are encountered all year long.<sup>214</sup>

The dyking of reclaimed land was widely debated in the Low Countries. Various theories on land reclamation had been developed over the years, including the well-known 'Tractaet Van Dyckagie', written by Andries Vierlingh in the mid-sixteenth century.<sup>215</sup> It was an issue which undoubtedly occupied Maurice, who had acquired the marquisate of Bergen op Zoom in the mid-1580s as well as other domains in northwest Brabant, where reclamation of mud flats had resulted in the extension of agricultural ground and new settlements such as Klundert and Ruigenhil, later to become Willemstad. It is hardly surprising, therefore, that Stevin, who had planned to discuss Willemstad in

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<sup>213</sup> S. Stevin, *Wisconstighe Ghedachtenissen*, 'Tweede Bouck des Eertclootschrift Vant Stofroersel des Eertcloots', p. 51: '[...] verder dan totten Huysbou stricken'.

<sup>214</sup> S. Stevin, *Wisconstighe Ghedachtenissen*, 'Tweede Bouck des Eertclootschrift Vant Stofroersel des Eertcloots', p. 56: 'Te weten dattet in Hollandt er dierghelijcke anwassende landen by de eyghenaers dickwyls in twyfel en twist statet, ofmen mette bedijking sal voortvaren of noch eenighe jaren tot den anwas van groter plat en hoogher cley is; wantmen van dies alle jaer tot veel plaetsen groote verandering siet'.

<sup>215</sup> J. de Hull and A.G. Verhoeven, *Andries Vierlingh, Tractaet van Dyckagie*, (The Hague 1920): *RPG*, Kleine Serie, no. 20.

*Huysbou*, turned his mind to the problem of land reclamation.<sup>216</sup> He was not content with a simple description of a natural phenomenon, arguing for a thorough discussion of how nature could be turned to mankind's advantage: natural phenomena, which people played no part in creating, could play a significant role. Which is why Stevin originally intended to cover land reclamation in his architectural treatise. Stevin also mentioned other examples of ways in which nature could be manipulated, such as the stimulation of dune formation on the island of Goeree by the planting of reeds.<sup>217</sup>

Conversely, Stevin maintained that the study of architecture could also contribute to greater insight into natural phenomena.

One finds, in the thick, old walls, like those of the towns and castles that are currently being dismantled in many places, that the outer bricks and mortar are soft, easy to break away, but at a deeper level one finds these to be extremely hard, as if of a single stone [...] In this way, if they were to systematically investigate, through experience, what remains sound and what becomes impaired, they would be able, as we have said, to improve the knowledge of the causes.<sup>218</sup>

The implications of the discovery of the reasons for the hardening of the subsoil could then be applied to architecture. These changes at subterranean level not only influenced the penetration of rainwater and thus the availability of drinking water in the town, they also determined the consistency of the building ground. Issues addressed elsewhere in 'Eertclootschrift', such as *quelmwater* (groundwater) and *welsandt* (quicksand that rises when wells are dug), yielded similar results.<sup>219</sup>

Stevin discussed the intimate relationship between natural phenomena and intervention in nature to make a place habitable when he referred to meander formations of rivers caused by *strandt* (accretion) and *schoor* (erosion):

To explain the causes of the erosion and accretion of rivers: and also how they continually bend further and further. Here enormous movements of erosion and accretion occur in the earth, knowledge of which is useful for the essence of a number of

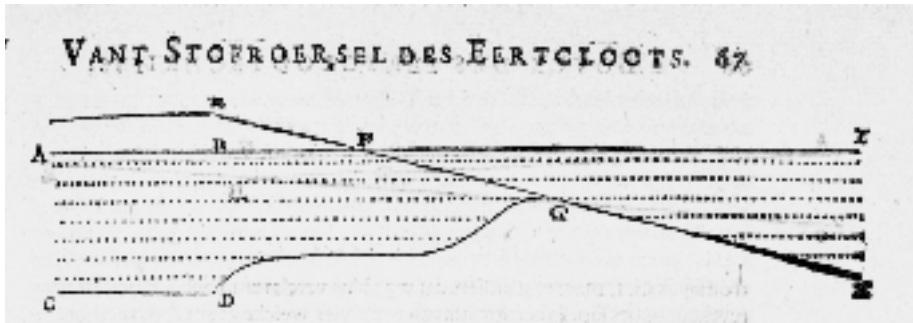
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<sup>216</sup> In his list of contents H. Stevin included the section about the wooden dam at Willemstad as part of the chapter 'Vandeoirndening der steden'. See below, p. 512.

<sup>217</sup> S. Stevin, *Wisconstighe Ghedachtenissen*, 'Tweede Bouck des Eertclootschrift Vant Stofroersel des Eertcloots', p. 58.

<sup>218</sup> *Ibid.*, p. 63: 'Men siet in dicke oude mueren, als van Steden en Sloten diemen nu te veel plaetsen afbreeckt, dat d'uyttertse backsteenen en moortel weyck sijn, licht om afbrecken, maer dieper comende bevint ment seer verhart, gelijk oft allemael een steen waer [...] Inden vougen dat men alsoo deur ervaring hen oirdentlick ondersouckende op een sekere gront, watter vast gaet watter hinckt, men soude ghelijck wy gheseyt hebben tot beter kennis der oirsaken meughen gheraken'.

<sup>219</sup> *Ibid.*, pp. 68-69.



Ill. 10 Underwater bar outside harbour in *Eertclootschrift* in *Wisconstighe Ghedachtenissen* (1605-1608)

things, such as relating to the purchase, dyking, breakwaters, damming and forward-damming of the land, as well as the foundation of towns, field works and the fortification of places, enabling one to see where to expect land to accumulate and where it will erode as time goes by.<sup>220</sup>

Illustrating this natural phenomenon with a schematic diagram, Stevin explained that successful cities on rivers, such as Antwerp, London, Cologne, Nijmegen and Rotterdam are generally situated on the side where the bank is eroded, i.e. the inside bend, since the depth makes it easier for ships to enter as well as facilitating loading and unloading, further erosion being prevented by the construction and maintenance of quays and stone or wooden piers.

Stevin's discourse on 'D'oirsaeck waerom voor de havens ten eynde der rivieren onder het water dorpels ligghen' ('The reason for underwater bars outside harbours in river estuaries') also had implications for towns (ill. 10). In both sections Stevin stated that he intended to address these matters in greater detail in *Huysbou*.<sup>221</sup>

Although that never happened, the subject of improving harbour entrances and the use of piers for maintaining the depth of waterways was raised again in *Nieuwe Maniere van Sterctebou door Spilshuysen*. Just as Stevin rarely limited himself

<sup>220</sup> Ibid., p. 64: 'Te verclaren d'oirsaeck van schoor en strant der rivieren: Oock hoe datse altijt crommer en crommer werden. Daer ghebeurt in d'eerde noch een groot roersel van schoor en strandt, waer af kennis der ghedaente tot verscheyden dinghen voorderlick is, als onder anderen int coopen, bedijcken, cribben, bedammen, en beduyckeldammen der landen, oock int legghen van Steden, Schansen, en int verstercken van plaetsen, op datmen mach sien waer in te commende tijt anwas waer afbraeck te verwachten staet'.

<sup>221</sup> Ibid., p. 65: 'daer leggende en onderhoudende cayen en hoofden van steen of hout, na de gheleghenthey: Doch want eygentlicker hier af inden Huysbou ghehandelt sal worden, en segghen daer af niet wijder' and p. 67: 'Angaende de wijze van verdieping der dorpels, welcke deur kennis der oirsaken met meerer sekerhey gheschien can, die hebben wy inden Huysbou veroident'. Cf. S. Stevin, *Huysbou*, [VIII-4], Van de havens en van de hoofden der havens.

to mere descriptions of geographical situations in ‘Eertclootschrift’, he did not confine the presentation of his new defence method to a simple description of the problems of military architecture. In *Nieuwe Maniere van Sterctebou door Spilshuysen* the location of towns beside water was again at the core of the argument. Stevin listed the following categories: towns by the sea, towns on large non-tidal rivers and inland towns, and then applied this to actual Dutch towns (ill. 11). Finally, he took each individual category – Amsterdam, Rotterdam and Willemstad on tidal waters, Bergen op Zoom and Middelburg sufficiently far from water to allow a military camp to be established in between, Heusden on the river, The Hague inland, and so on – and examined how they could best be defended with a system of locks as described in previous chapters. The geographical circumstances formed the basis for a typology of Dutch towns, providing models for new methods of defence at similar locations.<sup>222</sup> Stevin closed his *Nieuwe Maniere van Sterctebou door Spilshuysen* with three proposals for applying this method at Calais, Flushing and Deventer (ill. 12).

In general, ‘Waterschuyring’ employed the same typology of towns according to geographical situation as used in *Nieuwe Maniere van Sterctebou door Spilshuysen*. To support his theoretical and schematic arguments, Stevin referred to existing towns: the wide channel at Sluis for example, or harbours at places far from the sea in dyked areas such as Bruges, Leiden and Middelburg, as well as coastal towns such as Ostend, located between the dunes and the sea (ill. 13). In the posthumously published ‘Waterschuyring’ Hendrick Stevin briefly noted that his father had intended to visit various harbours.<sup>223</sup> In the second part, he followed the section entitled ‘Van sommige vonden onses Vaders tot verbetering van Steden en landen deur Havens en waterschuyring’ (‘Some of our father’s inventions for improving the harbours and water erosion of cities and countries’) with illustrations of practical applications of scouring by water in mainly foreign cities, suggesting that these were the harbours which Stevin had intended to visit to complete his discourse.<sup>224</sup> In contrast to his son’s rather vague remarks, however, Beeckman’s transcript of ‘Waterschuyring’ contains Stevin’s own comment that he still intended to visit Middelburg,

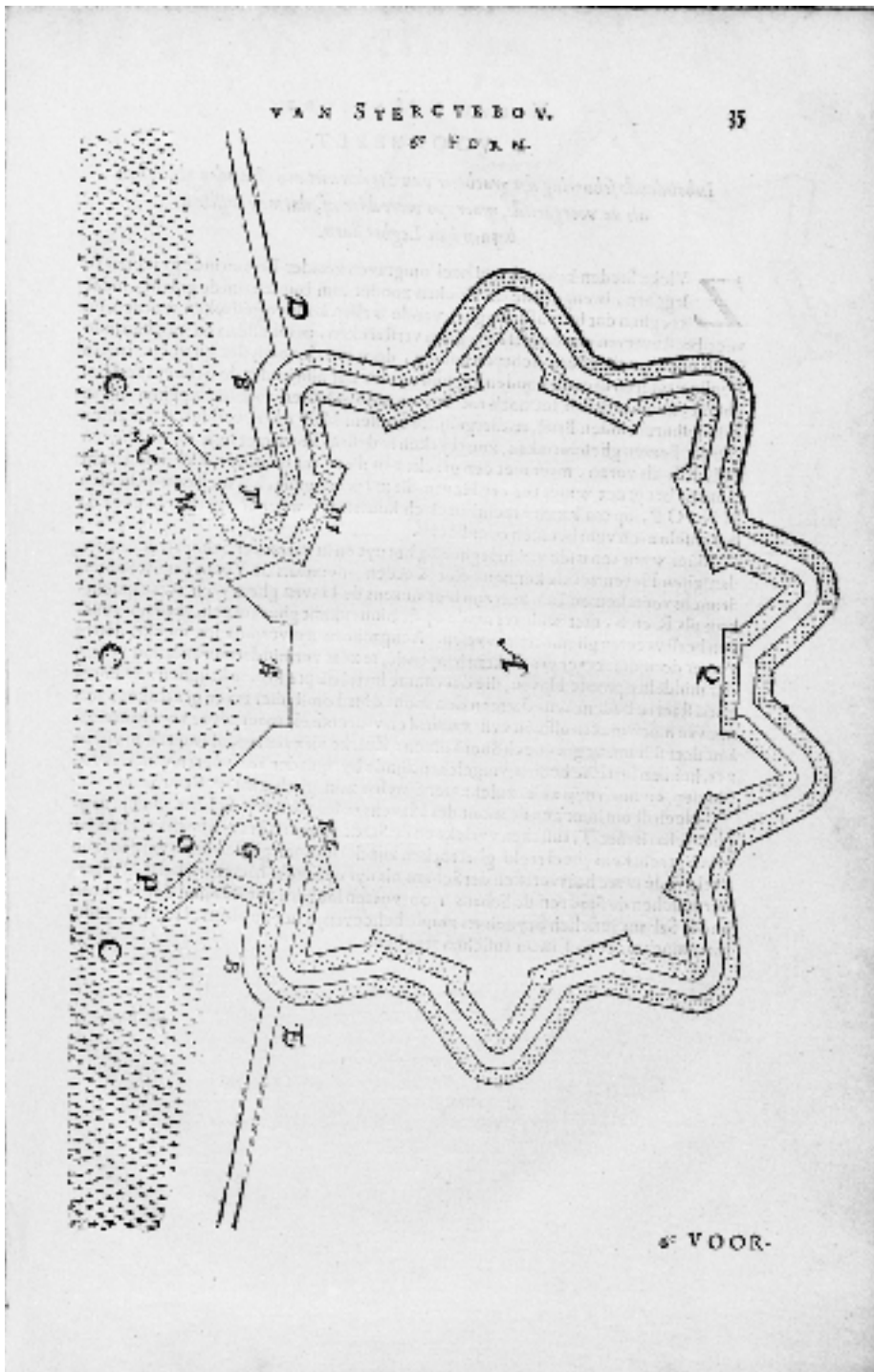
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<sup>222</sup> See also, C. van den Heuvel, ‘De Huysbou en de Crychshandel van Simon Stevin: Nieuwe theorieën van de Hollandse stad en van haar verdediging’, in *De zeventiende eeuw*, vol. 10, (1994), no. 1, pp. 79–92, esp. 86–89.

<sup>223</sup> H. Stevin, ‘Vanden handel der Waterschuyring’, [fol. 51], in *The Principal Works of Simon Stevin*, vol. v, p. 235: ‘Te gedencken dat hier moeten beschreven worden ettelicke voorbeelden vande redens der gaten en ander omstandigheden, die ick van verscheyden plaetsen noch besichtigen moet’.

<sup>224</sup> This ‘twede onderscheyt’ contains proposals for foreign cities: Danzig (3 versions), Weichselmünde, Braunsberg, Elbing, Lingen, Rheinberg and Calais. The Dutch examples represent Stevin’s plans for flooding around Deventer and the county of Zutphen, and for combatting the silting of Schiedam harbour.

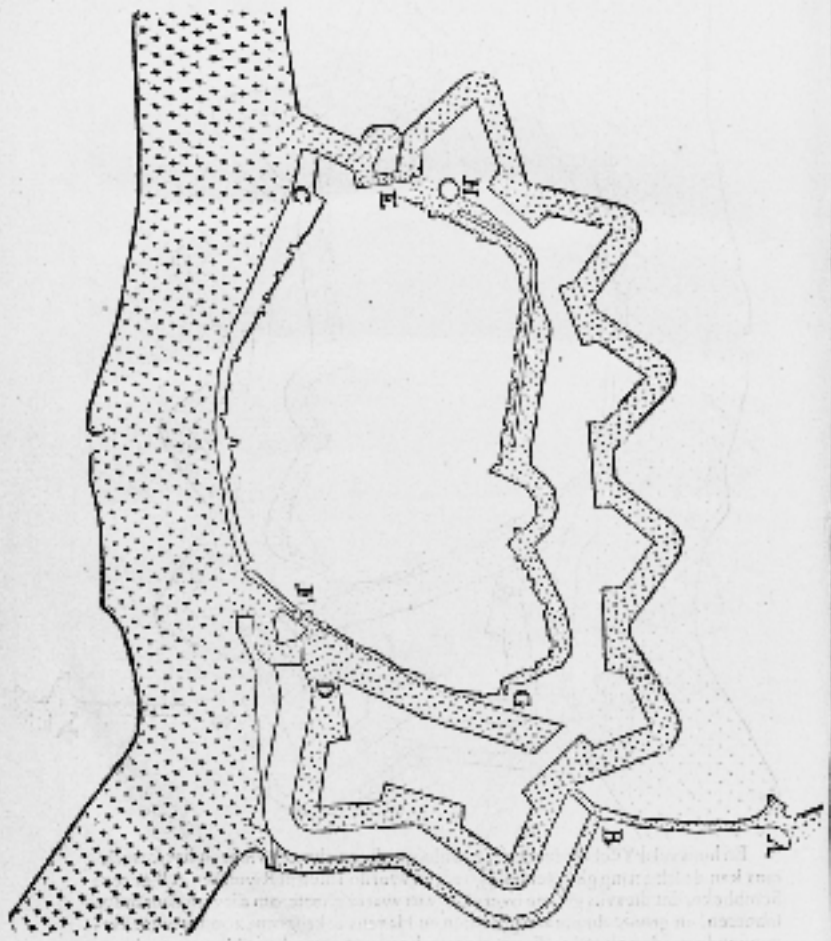




Ill. 11 Fortified City defended by double canals and pivotted locks, in *Nieuwe Maniere van Sterctebou door Spilshuysen* (1617)

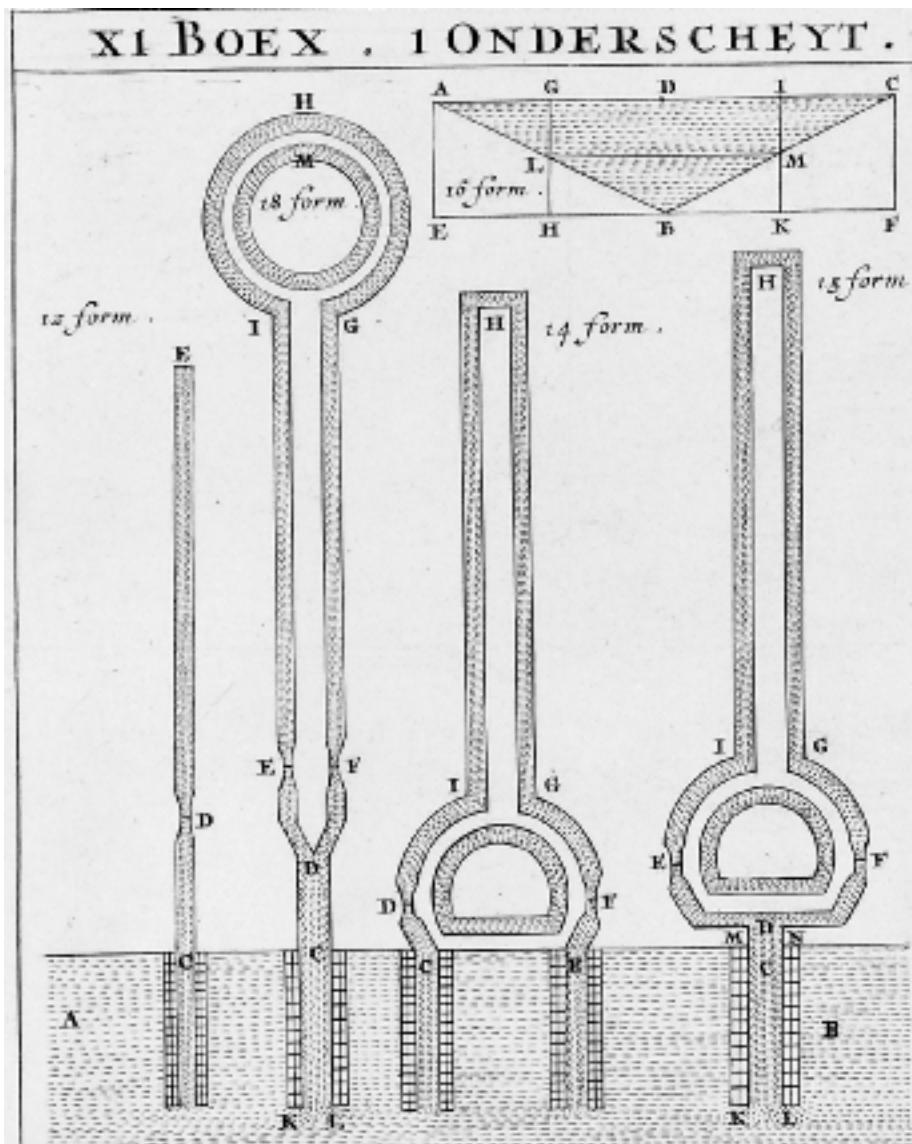
60 NIEUWE MANIERE  
 den gemeynen regel van het 7<sup>e</sup> Vantbeeld; des 1<sup>o</sup> Hoofstuks, te verren, datmen  
 vvech nemende de twee Betren CD des 7<sup>e</sup> Form. zoude liggen als in de volgende  
 6<sup>e</sup> Form. twee Spilluysen ter plaats van EF, of elders zoemen't outboordt ver-  
 stonde. De Schepen vonders noot kunnen ligghen en teghen ligane haer verber-  
 ghen binnen de Stadt in d'oude gracht GH, die merre ghemeyne schraeging ooc  
 zonde kunnen verdiepen, alisen het eynde aen G deat flake,

6<sup>e</sup> FORM.



MERCT.

Ill. 12 Deventer with pivotted locks, in *Nieuwe Maniere van Sterctebou door Spilluysen* (1617)



Ill. 13 The problem of scouring in different types of harbours from Stevin's *Waterschuyring* published by H. Stevin in *Wisconstich Filosofisch Bedryf* (1667)

Amsterdam, Delfshaven, Rotterdam, Goeree and Flushing to determine the width and depth of their harbours, and that he also planned to gather similar information about Dunkirk.<sup>225</sup> It is debatable whether Hendrick Stevin actually reflected his father's true intentions by focusing on foreign examples.<sup>226</sup> The latter had visited the majority, if not all, of these places before the turn of the century, giving him ample time to incorporate this data in *Nieuwe Maniere van Sterctebou door Spilshuysen* in 1617. Although he referred to his proposal for Calais in this work, the scientific foundation and application of Stevin's system was based solely on Dutch towns in varying geographical situations. This contrasts sharply with, for example, Stevin's *Sterctenbouwing* of 1594, in which the proposed defence, apart from a few devices, tallies broadly with the international theory of fortification construction.<sup>227</sup>

Indeed, Beeckman's transcript, copied after Stevin's death, does not include the *vonden* (inventions) for foreign cities as part of the manuscript collection that survived from 'Waterschuyring'. While Stevin never explained why he preferred not to include these examples in any of his works, it seems likely that he strove to base his theories as far as possible on the situation in the Low Countries, and that water therefore formed a significant topic. It is therefore worth taking a closer look at the role of water in his architectural theory.

#### *Water in the house and in the town*

Stevin planned to discuss the relationship of water and the built environment in his more or less comprehensive treatise. In fact, since these ideas were dispersed across several publications, water features prominently in the printed and handwritten fragments that make up *Huysbou*.

Water formed a key element in the initial discussion of underground works following the general introduction on the terms of architectural theory. Certain sections of the text intended for the discussion on the *grondvastigh* (foundations) found their way into 'Eertclootschrift'. These contain observations on suitable building ground, focusing problems inherent in building on less solid ground and those resulting from quicksand and seepage. Quicksand, Stevin explained, was the result of groundwater welling up from deep down, making the soil less suitable for building and requiring complex solutions. Stevin noted

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<sup>225</sup> S. Stevin, *Huysbou* [VIII-4], 'sluysen die bequam sijn' p. 000. Cf. I. Beeckman, Journal, fol. 208 verso l. 11-17.

<sup>226</sup> H. Stevin, 'Vanden handel der Waterschuyring', [fol. 55], in *The Principal Works of Simon Stevin*, vol. v, p. 245: '[...] tweede onderscheyt [...] Van sommige vonden onses Vaders tot verbetering van Steden en landen deur Havens en waterschuyring'.

<sup>227</sup> See chapter 2, p. 51.

that in Rotterdam the subsoil was more than 60 feet deep, too deep to take piles.<sup>228</sup> He did, however, offer a scientific explanation of why it was better to drive piles through dry ground into the firmer subsoil deep beneath the water, commenting that ‘the water fills up the spaces between the sand so that the compressed sand cannot give way’.<sup>229</sup> But apart from these brief remarks in Beeckman’s annotations no further references to Stevin’s views on foundations have survived. Stevin’s observations on ‘well sand’ on the other hand, can be found not only in these notes, but also in Huygens’s manuscripts. The latter addressed the theme in his didactic poem, *Domus*.<sup>230</sup>

More is known about Stevin’s observations on groundwater in *Huysbou*, while Huygens’s manuscripts contain important supplementary information. Under the heading ‘Bornputten, pompen en santboringh’ (‘Spring wells, pumps and drilling in sand’) in the same chapter on underground works, Stevin addressed methods of drawing drinkable water from the subsoil.

As in the surviving fragments on foundations, Stevin tailored his description of drilled wells to the situation in the Low Countries. Indeed, he triumphantly proclaimed the achievements of the Dutch in drilling *bornputten* (spring wells).

Besides Vitruvius, Pliny, Palladius and others also wrote about this; which those who wish may read. But since the new invention that has recently appeared in Holland is not found in any of these, I shall describe it.<sup>231</sup>

These references to ancient sources indicate that Stevin was not content simply to describe the drilling that took place in 1605 at Oudemannenhuis; he intended to add to the classical theories on the subject.<sup>232</sup> His analytical approach is illustrated in the detailed descriptions of the various types of soil encountered at different depths in the substrata. Stevin noted that the water is not necessarily better if the well is deeper, since it has to be extracted through layers of foul-smelling soil. For Stevin, however, the most fascinating aspect of this method was not that a depth of 232 feet had been reached, but that by simply maintaining the water level in the hole it was possible to prevent the sides from caving in.

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<sup>228</sup> S. Stevin, *Huysbou*, [II-1], p. 229. Cf. I. Beeckman, *Journal*, fol. 229v line 21-22.

<sup>229</sup> S. Stevin, *Huysbou*, [II-1], p. 229. Cf. I. Beeckman, *Journal*, fol. 229 v line 16-20.

<sup>230</sup> See chapter 8 p. 157.

<sup>231</sup> S. Stevin, *Huysbou*, [II-2] p. 231. Cf. H. Stevin, ‘Byvough’, p. 83. Cd. Busken Huet, *Land van Rembrandt: Studien over de Noordnederlandsche Beschaving in de zeventiende eeuw*, (Haarlem 1882-1884), only mentions this one invention in Stevin’s architectural treatise, despite discussing his various works in some detail. In part 2, section 2, p. 169, he quotes a passage from ‘Byvough’, p. 84.

<sup>232</sup> See also, Van den Heuvel, ‘De Huysbou en de Crijchshandel’, esp. pp. 84-86.

Again, these supplementary observations show that Stevin was not content with a description alone and tried to provide a theoretical foundation. Referring to the column of water that kept the well walls in place Stevin noted that ‘a mathematical calculation can be made’ by a process explained in *Beghinselen des Waterwichts*.<sup>233</sup> Apart from keeping wells free of sand, Stevin drew attention to another matter.

[...] when draining water from muddy or soggy ground where sometimes, when the water has been drained, the canal houses and other buildings nearby subside and threaten to collapse as has occurred in various places in Holland.<sup>234</sup>

From these general observations on groundwater Stevin moved on to rainwater, turning his attention to houses. He discussed collecting rain in tanks, as well as methods for improving the quality in *suiverbacken* (purification tanks). Stevin proposed a rainwater tank situated above ground, rather than the customary underground cistern, thus avoiding the need for pumps or buckets to draw up water. Stevin’s design for the rainwater tank was relatively simple. Water ‘containing dead mice and rats, cat and bird droppings and other filth’ would be collected in a rectangular lead tank with a funnel-shaped outlet at the bottom into which the sediment would sink. This could be drained away through a tap, while the clean water would be drawn off through another tap at the side. To prevent the latter becoming clogged with dirt the short pipe had a semicircular loop inside the tank. Excess water could be drained away along a separate pipe on the outside of the tank (see ill. 28). The water would be cleaned by filtering it through a purification tank, generally a container lined with porous brick. In some cases – and this was Stevin’s preferred method – the water would be purified by filtering it through sand. In schematic drawings (see ill. 29), Stevin illustrated how a column of water would percolate through two or more columns of sand separated by partitions.

Having discussed the water supply, Stevin turned to ways of draining *heymelicken* (privies). He explained how groundwater and rainwater could be used to combat the smell of the privy inside the house. He proposed making a pit deep below groundwater level. A straight pipe would conduct waste from the privy deep down into the ground where rainwater, continually percolating through, would refresh the groundwater. As the waste dispersed deep underground, the smell would be dispelled.<sup>235</sup> These pits would be better drilled than dug and, Stevin noted, had the advantage of not needing to be cleaned.

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<sup>233</sup> S. Stevin, *Huysbou*, [II-2] p. 237; cf. Huygens, ‘Manuscripts’ (Adversaria), fol. 147v.

<sup>234</sup> S. Stevin, *Huysbou*, [II-2] p. 237; cf. Huygens, ‘Manuscripts’ (Adversaria), fol. 147v.

<sup>235</sup> Beeckman criticised Stevin’s straight waste pipe and proposed a funnel shape to prevent the smells from rising. See De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 292.

Moreover, the groundwater could be further refreshed by channelling the water collected from roof gutters into these pits. Stevin also observed that privies should be fitted with pumps to draw water from sources less deep than the privy pit, providing water for domestic use and for cleaning the pot and the pit.

In the last paragraph of the chapter, headed 'Onderaerdse werken' ('Underground works'), Stevin turned from the supply and draining of water to how to keep water out of areas under the house, like the cellar. In fact the remaining passages on water in the house principally explore ways of preventing leaks and damp.

The struggle against water was also discussed in terms of the town as a whole. From the contents of 'Vande oirdeningh der steden' it is clear that Stevin was focusing on themes he had already discussed in other works such as 'Eertclootschrift', 'Waterschuyring' and *Nieuwe Maniere van Sterctebou door Spilshyusen*.

The passage 'Hoemen omt verdrincken der Steden en dorpen te voorkomen bedijckte landen doet hooger wassen die daer me oock veel vruchtbaerder worden' ('How to enable dyked lands to rise in height in order to prevent the flooding of towns and villages while ensuring that they also become more fertile') once again shows that Stevin aimed to use water itself in the endless struggle against this natural element. Stevin recommended building dykes to stem the gradual rise of river water, as he had already discussed in his 'Eertclootschrift'. But after a few years, drainage mills were invariably required to keep the land behind the dykes dry. Stevin was intrigued by the Egyptians who allowed the Nile to flood its banks in the spring to fertilise the land. He doubted, however, that this would work in the same way in the Low Countries. In old embanked regions the high flood waters would inundate villages and towns. Even in the recently dyked areas, where new houses could be adapted to the water level, allowing the land to flood could create problems. And where the reclaimed land of the polders was directly connected to estuaries it would damage the winter corn sown in September if, for example, the land were flooded by sea water in April. Instead, Stevin proposed inundating the land by a lock-controlled process once every two years with an area first being flooded by river water and then by polder water, thus allowing twice as much fertile soil to be deposited. In this way a virtue could be made of necessity by working with water rather than fighting it.

Stevin now moved from water in different geographical situations and towns to water in relation to a hypothetical town model. Taverne has pointed out that Stevin was referring here in particular to Dutch merchant towns.<sup>236</sup> For Stevin, the ideal location for a town was on the coast and on a major river.

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<sup>236</sup> Taverne, 'Stevens koopmanstad'.

This not only guaranteed trade with countries overseas but also the exchange of products with areas inland where other routes were either unsafe or difficult to negotiate. In Stevin's view, the viability of a town depended directly on the water. This therefore formed one of the principal elements in his design and layout of a town. While international architectural theory emphasised the royal palace, town hall and market place, Stevin's model town focused on a central canal. This longitudinal axis constituted the main link with the hinterland. His plan contained no roads outside the walls – except in the extensions which would also be surrounded by walls. The many bridges required in the town indicates the degree to which the grid was dominated by the canal system.

These waterways comprised a central artery flanked by two parallel canals halfway down the longitudinal axis and the outer canals on the long side. The three longitudinal canals, significantly called harbours, were also crucial to the supply of fresh vegetables and other perishable goods. For the same reason the meat and fish halls at the main market were also located near the water-side.<sup>237</sup>

Although Stevin did not state so explicitly, water also seems to have played a role in the defence of the royal palace. It has been noted that Stevin adopted an equivocal position in the discussion of the ideal location for the palace, which some thought should be sited half inside and half outside the town walls, while others maintained it should be in the centre.<sup>238</sup> Although the first location aroused suspicion about the sovereign's intentions because he could draw on help from outside to turn on the population, the disadvantage of the second option was that the sovereign would be unable to escape in an emergency. Stevin therefore situated the palace inside the town but against the walls. And whereas a castle moat might have occasioned the citizens' resentment, the canal system within the town was just as effective in ensuring the sovereign's security. Thus the royal residence was wedged in between the outer canal and one of the inner city canals, the latter extending far enough for the entire centre of the palace to be easily cut off, especially if the bridges were raised.<sup>239</sup> Moreover, any insurgents wishing to force their way through to the

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<sup>237</sup> S. Stevin, *Huysbou*, [VIII-3] p. 359. Cf H. Stevin, 'Eenighe stucken der Crychconst; Beschreven deur Simon Stevin', KB 128 A-9 II, fol. 10r The markets' unusual location beside the water has already been discussed in Taverne, *In 't land van belofte*, pp. 40-41, and more recently in De Mare, 'De keuken als voorstelling', in particular the passage on 'het voedseltraject met de keuken als centrum', pp. 190-192.

<sup>238</sup> On this discussion, see C. van den Heuvel, 'Les citadelles espagnoles et hollandaises des anciens Pays-Bas 1566-1625', in *Actes du 125e congrès des sociétés historiques et scientifiques: Lille-Villeneuve d'Asq du 10 au 15 avril 2000*, (Paris 2001).

<sup>239</sup> Unfortunately Stevin wrote nothing about the form of these bridges. If they were drawbridges they would certainly have contributed to the safety of the Royal Palace. Note that the illustration



palace from the other side of the town via the quays could be easily stopped at the central canal.

Clearly, the canals which were so vital for transport and safety in the town had to be deep enough and above all, clean. In ‘Waterschuyring’ and *Nieuwe Maniere van Sterctebou door Spilshyzen* Stevin described ways of deepening harbours and other waterways using flowing water. In *Huysbou* he followed this with a discussion on how to refresh and maintain the depth of water in stagnant canals.

Combatting water pollution and the resultant stench is certainly not a problem specific to our own times; it has engaged Dutch civic authorities for centuries.<sup>240</sup> Although his town was primarily a mercantile rather than an industrial one – and Stevin’s son therefore considered the passage on air and water pollution less relevant to his printed extract for the Amsterdam administration – Stevin’s discourse on ‘Hoemen ’t water van stilstaende stinckende grachten can ververschen’ (‘How to freshen malodorous stagnant canals’) was an important element in his architectural theory. He started by devising a system of sewers running under the streets to collect domestic waste water (see ill. 44) which was to be discharged into the canals. Industrial towns such as Leiden had to contend with pollution and stench from the urine used for felting material in the dyeing and fulling industries which was discharged into the canals. This would explain why people were eager to try out the patent that Stevin obtained for a device for sluicing out Leiden’s Rapenburg canal. Stevin’s device initiated a series of solutions to this urban problem which were presented to the town authorities in the course of the subsequent centuries.<sup>241</sup>

Although Stevin referred to a machine for diverting water when describing his method for purifying canals in *Huysbou*, it remains unclear whether he was referring to the device for which a patent had already been granted. Perhaps he intended to describe this device elsewhere in *Huysbou*, but he may equally have decided against it because improved machines had since been developed which were by then protected by new patents.<sup>242</sup>

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of Stevin’s town plan in Hendrick’s manuscript shows no bridges, KB 128 A 9 II. Fol. 10 Cf. ill. 4 with 43.

<sup>240</sup> J.A. Faber, H.A. Diederiks and S. Hart, ‘Urbanisering, industrialisering en milieuaantasting in Nederland in de periode 1500-1800’, in *A.A.G. Bijdragen*, 18, (1973), pp. 251-271; see also, C. van den Heuvel, ‘Hollands verstedelijkt landschap’, in E.R.M. Taverne and I. Visser (eds), *Stedebouw: De geschiedenis van de stad in de Nederlanden van 1500 tot heden*, (Nijmegen 1993), pp. 39-44.

<sup>241</sup> Proposals for purifying the Leiden canals were regularly put to the town administration from the early seventeenth until well into the nineteenth century. See S. van der Pauw, *Verhaal van de middelen tot verversching van het water in de grachten der stad Leyden gedurende een reeks van bijna 250 jaren*, (Leiden 1828) and G. Steenmeijer, *Arent van ’s-Gravensande (ca. 1610-1662) Architect en Ingenieur*, (Leiden University PhD) [typescript] 2001, esp. 3.2.5.1.

<sup>242</sup> On 11 April 1590, for example, Cornelis Blommert (possibly Cornelis Bloemaert, the architect, painter and fortress engineer) cum sociis applied for a patent for twelve years for a device to

What is important is that Stevin considered the practical problem of cleaning urban canals, which plagued many Dutch towns, as part of his architectural theory. His method was relatively straightforward. A 100 to 200 foot section of the canal would be dammed and excavated to the point where the groundwater rose up in a constant flow without bringing up any quicksand. Continually refreshed, the water would be pumped into the polluted section of the canal, gradually purifying it. The clean section of the canal would be covered to ensure that pollution from the surface water did not interrupt the flow of clean groundwater.

Apart from purifying the water, increasing the depth of canals was also vital to urban security since shallow canals were an advantage to potential enemies. In addition to purifying the inner city canals, Stevin developed a similar method for purifying moats. Although in his manuscript Hendrick Stevin added this to the transcripts entitled 'Vande oirdeningh der steden', this was probably initially intended for the comprehensive treatise on 'Crychconst'. While safety was not presented as an argument in the passage on maintaining the depth of water, it probably played a part in Stevin's town.

#### *Stevin and water: postscript*

Stevin's unshakeable conviction that a scientific study of water would be beneficial to the Low Countries was already apparent in *Beghinselen van het Waternicht* of 1586. Indeed it coloured all his discussions of the relationship between water and building in the Low Countries. The three works that stemmed in part from *Huysbou* each show a different facet of the relationship. In 'Eertclootschrift' Stevin focused on the description and research on geographical phenomena, in 'Waterschuyring' he discussed the possibilities of harnessing and manipulating natural phenomena to create favourable living conditions, and finally in *Nieuwe Maniere van Sterctebou door Spilshuysen* he proposed ideas on how to safeguard these living conditions by controlling the water. He showed that water could be a harsh adversary, but also a faithful ally. Water became an important, if not the principal element of a new defence system specifically tailored to conditions in the Low Countries. Stevin displayed a similar approach to water in his description of the house and the town in the texts which have survived as fragments of *Huysbou*. He was concerned with the adverse effects of water from the micro-level of the toilet waste pipe to such major

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excavate all the canals etc, to a depth of six or seven feet, and to maintain them in that way without making a dam or draining water. On 14 March 1600 a patent was granted to an unknown person who claimed he could drain 300,000 tons of water out of the canal in 24 hours. See Doorman, *Octrooien voor uitvindingen*, pp. 89 and 101 ff.

operations as purification of the water in urban canals. Conversely, Stevin also focused on collecting water for domestic use and he realised that water, when controlled, could contribute to the accessibility, prosperity and security of the town. Indeed, to a large extent Stevin's architectural theory appears to have been founded on water.

## 5. Stevin and the representation of architecture

*[...] inexperienced owners of buildings may be more interested in artistically-fashioned decoration than in the best layout, making the worst choices. In that sense, simple elevations and ground plans may be regarded as more effective.*<sup>243</sup>

Stevin's main concern was not the form of the house or the town, but its underlying logic. Moreover, he considered it vital that this logical order be plain for all to see. Naturally, he had specific ideas about how this should be represented in illustrations. But since Isaac Beeckman, Constantijn Huygens and Hendrick Stevin's copies of Stevin's *Huysbou* texts were often incomplete and occasionally distorted and since Stevin's illustrations for his architectural treatise are known only through these extracts, they cannot be relied on to correspond to his original intentions. Fortunately, other sources, ranging from Stevin's architectural designs to illustrations in treatises published during his lifetime, shed more light on the matter, as do his observations on how to visualise architectural concepts, both in the surviving texts of *Huysbou* and in other works.

### *Stevin's drawings*

While Stevin was first and foremost an engineer and although various documents mention his fortification plans, no extant examples can be attributed to him with any certainty.<sup>244</sup> Paradoxically, the only known drawing (see ill. 3) that bears his name was made in his less usual role of civil 'architect'.<sup>245</sup> Apart from

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<sup>243</sup> S. Stevin, *Huysbou*, [III-4], p. 271. Cf. H. Stevin, 'Byvough', p. 103 '[...] dat onervaren eygenaers des gebous, meer siende na 't cieraet door de constighe hant gewrocht, dan na de beste oirden, het quatste verkiesen; Indervougen dat slechten gronttreck en stanttreck in sulcken ansien bequamer is.'

<sup>244</sup> For a survey of these incorrect attributions see F. Westra, 'Bestaan er getekende militair topografische kaarten of vestingplannen van Simon Stevin?', in *Caert Thresoor: Tijdschrift voor de geschiedenis van de kartografie in Nederland*, vol. 12, (1993), no. 4. Moreover, a drawing by Kampen – attributed to Stevin since Westra's survey – is probably not by him either. Chr. Kolman quotes a document which mentions that after revising a drawing Maurice ordered 'Symen schilder' [Simon the painter] to make a new plan from his design and drawing. If nothing else, however, Stevin's criticisms of the profession would preclude his having been an artist. Moreover, as an engineer Stevin would have been more inclined to produce the designs than the presentation drawings: Chr. J. Kolman, *Naer de eisch van 't werck: De organisatie van het bouwen te Kampen 1450-1650*, (Utrecht 1993), p. 305.

<sup>245</sup> The Hague NA, VTH 3509. Inscription on the reverse: 'Plante van Syns Ex.ies huys tot Vli-singen, overgelevert by M. Simon Stevin op den xten Martij 1617' published by F. Vermeulen,

the problems inherent in a comparison between designs for actual building commissions and illustrations for a treatise on architecture, there are simply not enough drawings by Stevin to show in any detail how he originally intended to illustrate *Huysbou*.<sup>246</sup>

The illustrations that provide the best approximation are those from works in which Stevin addressed similar subjects to those in the architectural treatise. These, viewed in conjunction with Stevin's observations on the depiction of architecture, are crucial to the study of the *Huysbou* illustrations.

### *Stevin on the representation of architecture*

Long before he proposed to incorporate *Huysbou* in *Wiscontighe Gbedachtenissen*, Stevin addressed the subject of architectural drawings in a short essay on architecture composed for private use. All that is known about the content of this work is that Stevin discussed the use of perspective drawings in architecture. Although he was to elaborate on this in 'Vande Deursichtighe' ('On perspective'), no further observations on the subject appear in the later lists of contents of *Huysbou*. The preface to 'Vande Deursichtighe' reveals something of Stevin's views. It relates how Maurice, having learned to draw plans and elevations, wished to move on to what Vitruvius termed scenography. He had taken lessons from eminent artists of his day, but was not satisfied with their explanation that they employed 'sight or guesswork' since he wished to understand the cause and the scientific basis of perspective drawing.<sup>247</sup> Eventually he turned to Stevin who had studied Vitruvius as well as other writers on the subject. Yet although Stevin shared Vitruvius's opinion that an understanding of perspective was useful in architecture, he apparently considered it more

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'Simon Stevin Bouwmeester van het Prinsenhuis te Vlissingen', in *Oudheidkundig Jaarboek*, vol. 4, 5, (1936), pp. 43-47. Vermeulen, and others after him, generally assumed that the other site drawings, 3513 B and 3513C, were later than the dated map CH 3510 with the design of the garden for the bailliff J. van Berchen of 26 May 1623. But the gardens depicted on this map are similar to Stevin's drawing and appear to be of the same period, if not earlier. Perhaps they are by the same person and the garden in the drawing bearing Stevin's name is a systematisation of the gardens depicted, in slightly less regular fashion, in the site drawing. The designs for gardens in 'triangle' are probably not by Stevin. For a recent study on Stevin's role as architect see De Vos, 'Bouwen voor nut en vermaak', (Amsterdam 2000).

<sup>246</sup> It is not known for certain whether the drawings bearing Stevin's name were actually drawn by him, or simply commissioned by him to illustrate his proposed plans for the refurbishment of the Princehuys (palace) and the design for its new garden for Maurice at Flushing.

<sup>247</sup> 'Eerste bouck der deursichtighe, Vande verschauwing', [p. 4], in *The Principal Works of Simon Stevin*, vol. II b, p. 800. On Maurice's interest in drawing see C. van den Heuvel, "'Wiscontighe Gbedachtenissen'", (Amsterdam 2000).

relevant to painting.<sup>248</sup> Stevin disliked the way painters worked, adjusting the image to suit their perception instead of depicting the correct proportions:

Several experts in practical perspective drawing consider that in perspective drawing one should not follow the rules of this art quite perfectly, but sometimes give a more pleasant display, though it be contrary to the rule [...] But all this is wrong, [...].<sup>249</sup>

Stevin acknowledged that perspective drawings of people and animals were sometimes ‘drawn more pleasantly and easily by a free stroke of the hand’, but noted that architecture should be drawn with straight lines, preferably using a ruler.<sup>250</sup> Stevin’s main concern was mathematical accuracy, which he illustrated with schematic diagrams.<sup>251</sup> These figures (ill. 14) were so abstract and complex, however, that they offered painters no real alternative to those in the works on perspective by Serlio or Vredeman de Vries.<sup>252</sup> Neither did perspective drawings seem particularly useful for those working in the building trade. Although they gave clients a striking spatial impression, it was impossible to see whether the proportions and dimensions were correct, so that they were nevertheless forced to rely on plans, elevations and sections. In this, Stevin departed from the author of *De Architectura* and commentators such as Barbaro

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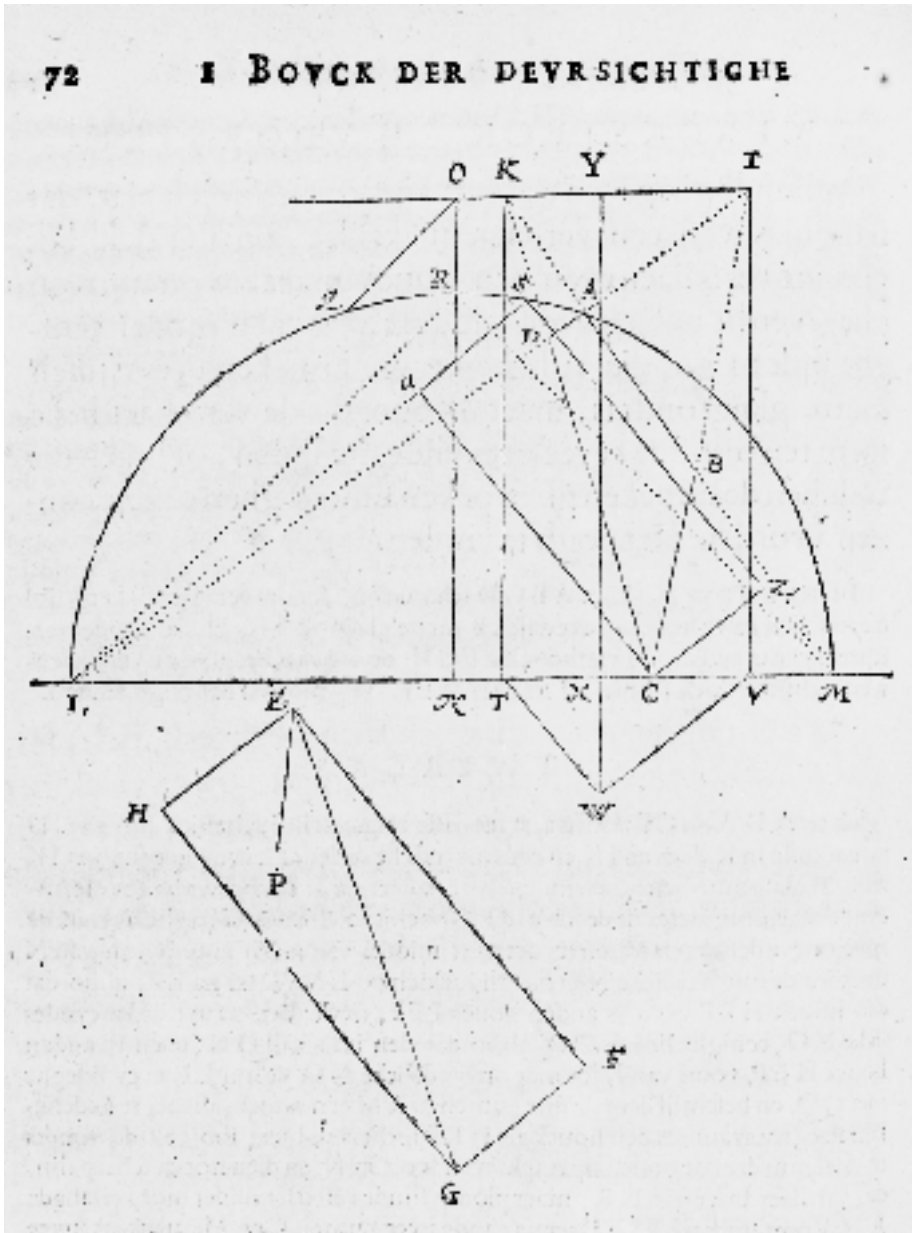
<sup>248</sup> Stevin was not alone in this view. Alberti, for example, included one of the main texts on perspective in his *Della Pittura*, rather than in his architectural treatise *De Re Aedificatoria*.

<sup>249</sup> ‘Eerste bouck der deursichtighe, Vande verschaeuwing’, [p. 957] published in *The Principal Works of Simon Stevin*, vol. II b, p. 957: ‘6 Hooftstick vande volcommen navolging der const’: ‘Ettelicke meesters in dadelick verschaeuwen, houdent daer voor, datmen int verschaeuwen, niet heel volcomelick en moet navolghen de reghelen deser const, maer somwijllen wat behaghelicker voor t’oogh stellen dat teghen de reghel gaet: [...] Maer al dit is ghemist’.

<sup>250</sup> ‘Eerste bouck der deursichtighe, Vande verschaeuwing’, [p. 88] published in *The Principal Works of Simon Stevin*, vol. II b, p. 959: ‘deur een vrye hanttreck behaechelicker sijn als ander deur moeylicke teyckening nae reghelen der verschaeuwing ghewrocht’.

<sup>251</sup> After the introduction to Stevin’s work on perspective by D.J. Struik, *The Principal Works of Simon Stevin*, vol. II b, pp. 785-792, the following studies are also important: R. Sinisgalli, *Per la Storia della Prospettiva (1405-1605): Il contributo di Simon Stevin allo sviluppo scientifico della prospettiva artificiale ed i suoi precedenti storici*, (Rome 1978), esp. pp. 124-349. For a recent comprehensive discussion of Stevin’s ‘Deursichtighe’, see K. Andersen, ‘Stevin’s Theory of Perspective: The Origin of a Dutch Academic Approach to Perspective’, *Tractrix*, 2, (1990), pp. 25-62.

<sup>252</sup> The author has gone into this matter in greater depth in “‘t Samenspreekinghe betreffende de Architecture ende Schilderkonst”: Schilders, Architecten en Wiskundigen over de uitbeelding van architectuur’, in *Incontri: Rivista europea di studi italiani*, (1994), vol. 1, pp. 69-85. See also, E. Gerritsen, ‘De architectuurtekening in de 17<sup>de</sup> eeuw’, in J. Boonstra [red.], “‘Soo vele heerlijcke gebouwen”. *Van Palladio tot Vingboons*, [tentoonstellingscatalogus Bijbels Museum Amsterdam 1997], Amsterdam 1997, pp. 40-61.



Ill. 14 Demonstration of perspective, *Wisconstige Gbedachtenissen* (1605-1608)

who had recognised the problem but replaced Vitruvius's third category of perspective drawing or scenography with the profile.<sup>253</sup>

For Stevin, who preferred to approach each problem individually, it was the limited use of perspective drawings for the depiction of buildings that convinced him not to employ these in his architectural treatise. Stevin's drift away from the traditional classification into three types of drawings in his attempt to establish the best way to convey information was already evident in *Sterctenbouwing* of 1594. Although Stevin noted that he intended to explain the main terms of fortification using the 'three commonly used methods of architectural representation', these were not the usual categories of plan, elevation and perspective drawing, the latter being dropped in favour of *lichaemelicke* or physical presentation.<sup>254</sup> Five of the eight drawings were plans – showing the entire fortress and a number of details – while the two others were profiles of the ramparts with sections at two key points. The eighth and last drawing was a representation of a three-dimensional model of the fortress (ill. 15).<sup>255</sup> For Stevin, the purpose of architectural drawings was to convey information enabling correct decisions to be made and mistakes to be avoided.<sup>256</sup> In a departure from other writers, however, Stevin also focused on the potential of architectural illustrations as an educational tool.<sup>257</sup> Indeed, the main function of

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<sup>253</sup> D. Barbaro, *I Dieci Libri dell'Architettura di M. Vitruvio, tradotti & commentati da Mons. Daniel Barbaro*, (Venice 1567; facs. Milan 1987), p. 30: 'Portrebbe dire alcuno che detta difinitione non quadra al profilo; io rispondo, che essendo tanto necessario il profilo, & molto piu, che la prospettiva, bisogna considerer bene la detta definitione'. See also the introduction to this facsimile publication: M. Tafuri, 'La norma e il programma: Il Vitruvio di Daniele Barbaro' and C. van den Heuvel, "'t Samenspreekinghe betreffende de Architecture ende Schilderkonst": Schilders, Architecten en Wiskundigen over de uitbeelding van architectuur', in *Incontri: Rivista europea di studi italiani*, (1994), vol. 1, pp. 69-85; paper given at the symposium 'Disegno italiano, Disegno neerlandese: theorie en praktijk van disegno c.q. tekenen in Italië en de Nederlanden 1500-1700' at the Rijksmuseum Het Catharijneconvent in Utrecht on 15 February 1993.

<sup>254</sup> Stevin, *Sterctenbouwing*, [p. 1], in *The Principal Works of Simon Stevin*, vol. IV, p. 53: 'bepalen, door 't behulp der drie gheemeene manieren van formen, als grondteyckeninghe, verheven teyckening, ende lichaemelicke teyckening'.

<sup>255</sup> Stevin, *Sterctenbouwing*, [p. 26], in *The Principal Works of Simon Stevin*, vol. IV, p. 99: 'De platte lijfbeeldinghe [in margin: Orthographia] van sulcke lichaemelicke stercte, is als dese volgende 8<sup>e</sup> form anwijst'.

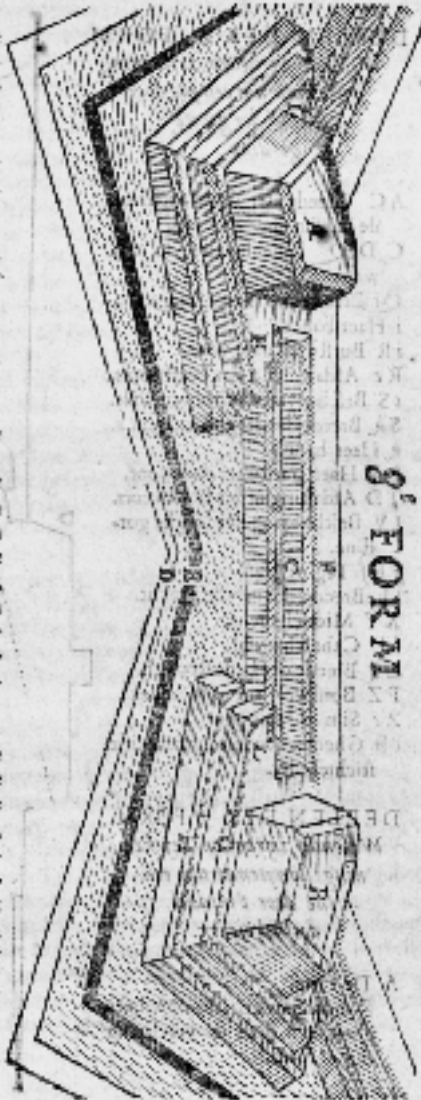
<sup>256</sup> Stevin, *Sterctenbouwing*, [p. 7], in *The Principal Works of Simon Stevin*, vol. IV, p. 65: 'op dat de personen die daer afte spreken hebben, deur soodanighe formen malcander wel verstaen meughen, ende eintlick het beste daer af besluyten'.

<sup>257</sup> For Stevin's illustrations as educational tools see, K. Lenk/P. Kahn, 'To show and Explain: The Information Graphics of Stevin and Comenius', in *Visible Language*, vol. 26: 3/4, (1991), pp. 273-280. Unfortunately these authors, today famous information-designers of website architecture, did not study the educational power of Stevin's architectural illustrations.



Altho verduert wefende de  
 grootteykeninge ende verhe-  
 ven teykeninge iat plate, soo  
 isf outbar voor de gheue die  
 vloemmen kennis vande ey-  
 ghenfchappen ende rindem-  
 ghen der stercken beghert,  
 dat by sulcke plate teykenin-  
 ghen doe menscken in licha-  
 melicke formen van eenighe  
 bequame stof als hout, was, of  
 poterde: Want ghelijc inde  
 \* Weerltsbefeuring goet is,  
 hienevo der \* cloot plate af-  
 beelcinghen, noch te hebben  
 vericheyde lichaamelike cloot-  
 ten, als des oriettes, der vette  
 fluten, der \* Dwaelers, en  
 dierghelijcke: Alson sijn hier  
 oock de lichaamelike formen  
 der stercken stercken, om allen  
 onstandighen dies angende  
 noch grondlicker te kennen,  
 ende om mer alleen te versien  
 wat ander segghen, moet op  
 datmen uijt vercheyden meyn-  
 ington van besse mach on-  
 deden.

De plate \* lijf beelcinghe  
 van sulcke lichaamelike stercke  
 met twee belwerken, is als  
 dese volgende S form ar wijf,  
 waer of der drien eyghen na-  
 men, die inde voogaende he-  
 polinghen des 1<sup>o</sup> Hoofstlick  
 becreven sijn, hier int casto,  
 meerder claerheyt halven, by  
 een vergeert worden.



Ill. 15 Illustration of three-dimensional model of two bastions and curtain, from *Sterckenbouwing* (1594)

these particular representations was to show how to use the terms employed in the treatise.<sup>258</sup> Having explained the principal concepts, Stevin elaborated on the educational potential of these drawings, taking a regular hexagonal fortress as an example. He showed several drawings both of ground plans and of physical models of clay, wax, wood and other materials, varying the three-dimensional models according to their function as well as the drawings.<sup>259</sup>

Stevin recommended three different types of model, each demonstrating a particular aspect and on a different scale: one of the entire fortress with its six bastions and streets, church, houses and other buildings, one of half a bastion on a larger scale showing details such as the three vertically situated gun emplacements, loopholes, staircases and approaches and one of two bastions linked by a curtain wall, again on a larger scale than the model of the entire fortress, to be used for demonstrating the angles of propulsion from the flanks of the bastions, the parapets on the walls and the gun platforms.<sup>260</sup> Stevin was convinced of the educational and experimental value of scale models for explaining and testing theories, particularly of the last of the three models illustrating the flank defence, the central principle of the latest innovations in fortification construction.

Similarly, Stevin recommended using models to explain the main terms and for further study in the syllabus Maurice had commissioned him to prepare for the students at his *Duytsche Mathematique* academy, who

[...] having sufficient experience in this, will be capable of undertaking the fortification or building of defences, for which wooden or earthen models of ramparts and bastions shall be prepared, and having learnt the authentic names, the drawing of maps or ground plans of cities will be easy, which will soon get them working for the cities. They will also draw on paper the perimeter of forts or towns with four bastions or more from which they will be given the measurements to mark out the fortifications in the field with markers.<sup>261</sup>

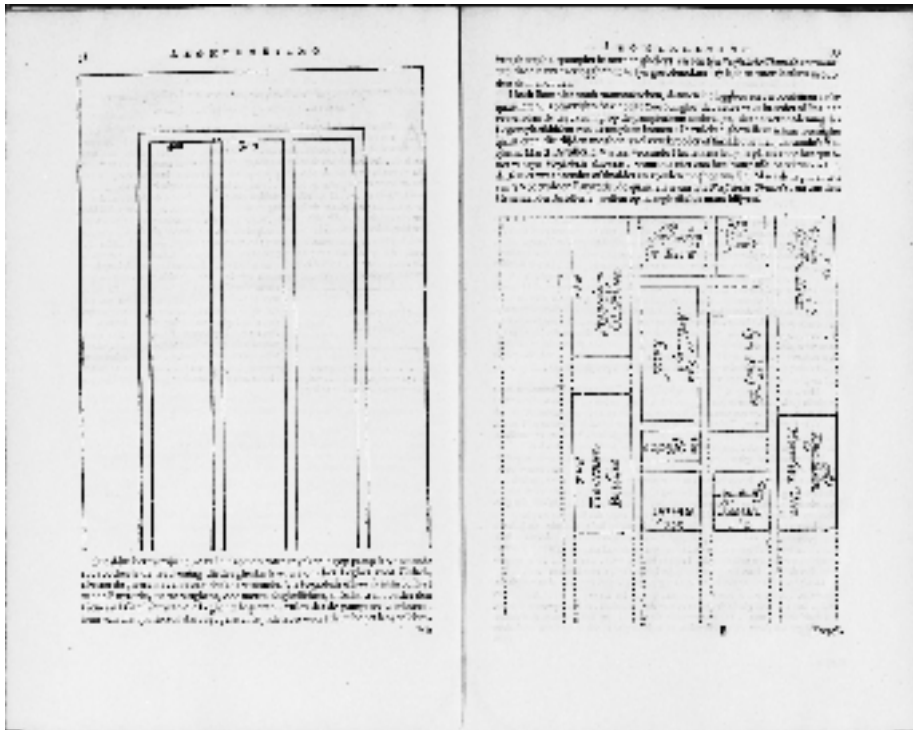
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<sup>258</sup> Stevin, *Sterctenbouwing*, [p. 1], in *The Principal Works of Simon Stevin*, vol. IV, p. 53: 'kennis der eyghen woorden ende namen van desen handel'.

<sup>259</sup> Stevin, *Sterctenbouwing*, [p. 7], in *The Principal Works of Simon Stevin*, vol. IV, p. 65: 'int cleen' 'platte op papier', and 'lichemelick van poteerde, was, hout of ander stof'.

<sup>260</sup> Stevin, *Sterctenbouwing*, [p. 27], in *The Principal Works of Simon Stevin*, vol. IV, p. 103: 'welcke dient tot spiegelhelingen des gheheels, van straten, kercke, huysen, met de reste' and 'bequam [is] om te ondersoucken met een ghespannen draet, alle strijckingen commende soo uijt de strijckhoucken, als van borstweeren der wallen en catten, na alle strijckelicke plaetsen'.

<sup>261</sup> Molhuysen, vol. I, p. 122: 'Hierin genoeg ervaren wesende sullen bequam syn om tot de fortificatie ofte sterk-bouwinge te komen, waertoe bereid sullen worden houten ofte aerde botsen van schanssen en bolwercken, ende daermede geleerd hebbende de eigen namen, soo sal het trecken van plannen ofte grondteekeningen van steden haer luiden ligt vallen, 'twelk men van steden ook dadelyk sal doen te werk stellen. Sy sullen ook tekenen op 't papier den omtrek van schanssen ofte steden met vier ende meer bolwerken, waar af men alsdan hen luiden de maten sal geven, ende sullen daar-



Ill. 16 The use of drawings in the design of army camps in *Castrametatio. Dat is Legermeting* (1617)

Although Stevin tried as far as possible to simulate the demands the young engineers would subsequently face, the drawings and models he employed in his syllabus centred on the theoretical and hypothetical rules of contemporary fortification design. Real warfare was quite a different matter. In *Castrametatio* Stevin adapted theoretical examples of military camps from antiquity to the requirements of the Eighty Years' War. This empirical approach is reflected in his discussion of the use of drawings in the design and layout of camps in the field, which he tested using illustrations of the siege of Jülich.<sup>262</sup> Stevin suggested drawing the various quarters in rectangles on sheets of card, each representing a length of 300 feet and widths varying according to the format of accommodation for officers and units of soldiers. Drawn to scale, the rectangles

na sulcke sterkten op 't veld tekenen met bakens.' See also Taverne, *In 't land van belofte*, pp. 61 ff. and F. Westra, *Nederlandse ingenieurs en de fortificatiewerken in het eerste tijdperk van de Tachtigjarige Oorlog, 1573-1604*, (Alphen aan den Rijn 1992), pp. 82-89.

<sup>262</sup> S. Stevin, *Castrametatio*, [Rotterdam 1617; pp. 32-42], published in *The Principal Works*, vol. iv, pp. 344-367. Particularly the first section: 'vande teyckening der vierhoeckighe quartieren des Leghers op pampier, omdat inde teyckening op 't landt na te komen'.

could be moved around on a grid of parallel lines, also representing distances of 300 feet, divided by spaces representing streets fifty feet wide. Where necessary – as in the camp at Jülich – these rectangles might be extended or made narrower to suit the arrangement of the camp (ill. 16).<sup>263</sup>

It is clear from his discussion of the design of a military camp that Stevin saw these drawings not as blueprints but as stages in a lengthy process of cutting and pasting components.<sup>264</sup> Stevin's view that architectural drawings were tools rather than autonomous objects – expressed in his comments on the representation of buildings by painters and in his remarks on the educational and experimental use of drawings and models in military architecture – helps explain his omission of the subject in *Huysbou*.

### *Illustrations in Huysbou*

Stevin's rejection in 'Van de Deursichtige' of the aesthetic focus on beauty and evocative imagery is echoed in *Huysbou* in his warning that ornamentation and perspective drawings only distracted clients from the actual layout of the building.<sup>265</sup> Thus Stevin accompanied plans of varying detail with a plain undecorated elevation of the façade. To this, clients could apply as much decoration as they wished – antique, modern or otherwise – based on the artistic examples widely available in print.<sup>266</sup>

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<sup>263</sup> S. Stevin, *Castrametatio*, [Rotterdam 1617; p. 35], published in *The Principal Works*, vol. IV, p. 351: 'dan de teyckening op de pampierkens mebrengt, dat de veroordening des Legers geschickter zoude mogen komen'.

<sup>264</sup> S. Stevin, *Castrametatio*, [Rotterdam 1617; p. 33], published in *The Principal Works*, vol. IV, p. 346: 'When all these pieces of card-paper, representing the various quarters, are all cut to measure and prepared, they are shifted about and reshifted until they have obtained the desired order'. Cf. above the discussion of the first drawing with the general layout of the house, giving the principal dimensions of the rooms without specifying its functions; once the latter was decided, however, the dimensions could be adjusted accordingly.

<sup>265</sup> S. Stevin, *Huysbou*, [III-4], p. 271. Cf. H. Stevin, 'Byvough', pp. 103-104. Stevin's viewpoint was perhaps based on Alberti's discourse on the differences between the drawings of architects and those of painters: L.B. Alberti, *De Re Aedificatoria*, (Florence 1485), II, 1: 'Inter pictores atque architecti perscriptionem hoc interest: q[uod] ille prominentias ex tabula mo[n]strare umbris et lineis et angulis comminutis elaborat: Architectus spretis umbris prominentias istic ex fundamenti descriptione ponit: Spatia vero & figuras frontis cuiusque & laterum alibi constantibus lineis atq[ue] veris angulis docet uti qui sua velit non apparentibus putari visis sed certis ratisq[ue] dimensionibus annotari'. Stevin makes various references to Alberti's treatise on architecture in his *Huysbou* and so may quite possibly have been familiar with this passage.

<sup>266</sup> S. Stevin, *Huysbou*, [III-4], p. 275. Cf. H. Stevin, 'Byvough', pp. 106-107.

Stevin's town plan, as shown in his son's manuscript, was also sober in character. Drawings of churches and warehouses, as well as other public buildings probably once existed, but none have survived. The town plan and the two ground plans and elevations of a house are the only remaining illustrations of Stevin's house and town. The profile (see ill. 44) of a street, which his son included to illustrate galleries, was probably originally intended as a technical drawing to accompany the description of the drainage system of covered gutters leading to an outlet in the middle of the road.<sup>267</sup>

Elsewhere, in other illustrations, Stevin demonstrated old and new building practices and explained the essentials of certain problems of architecture and town planning in hypothetical examples. In ground plans he showed the location of the rooms in Graeco-Roman houses and an equally abstract sectional view illustrated various structural aspects. Illustrations of chimneys (see ill. 55-61) accompanied a discussion of the advantages and disadvantages of contemporary models, like the drawings of roofs which were intended to illustrate Stevin's discussion of their various types. Stevin's hypothetical examples included schematic checkered patterns in which the shaded and spotted areas represented different rooms around courtyards, which he left blank. These did not represent alternatives to his model house; they illustrated layouts of houses based on the basic principles of maximum light, seclusion and mirror symmetry. The drawing (see ill. 45) of two alternative ways of dividing land along curved streets was meant mainly to show that although writers of some architectural treatises might have admired them, curved streets produced problematic plots of ground. Stevin introduced the rectangular town plan with illustrations in which the straight streets formed ideal building lots. For Stevin the shape of the town was not fixed, as his illustration showed: dotted lines indicated where the town could expand in an ordered way.<sup>268</sup>

Stevin also presented the components and amenities in both houses and towns as well as his theoretical reflections on the subject in explanatory illustrations. Precise cross-sections were drawn to demonstrate the ingenious rainwater tank, while the principle of water purification was presented with columns of various shades of cross-hatching. Similarly, the schematic representation of

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<sup>267</sup> S. Stevin, *Huysbou*, [VIII-3], p. 363, and ill. 44; KB 128 A 9 II, fol. 10r illustration. Description on fol. 8v.

<sup>268</sup> S. Stevin, *Huysbou*, [VIII-3], p. 367, and ill. 43. In a different illustration (see chapter 2 and ill. 46) Stevin indicated the continuation of the line in cruciform urban extensions. For Stevin's exceptional views on urban extensions see Van den Heuvel, *Papieren Bolwerken*, (Alphen aan den Rijn 1991), pp. 145-146 and more recently H. de Mare, 'Räumlich Markierungen holländischer Identität: Das grenzenlose Interesse von Simon Stevin (1548-1620) und Jacob Cats (1577-1660) an Grenzen und Grenzübergängen', in M. Bauer/T. Rahn, *Die Grenze. Begriff und Inszenierung*, (Berlin 1997), pp. 103-129.

well drilling at different depths and the technical detail of the appropriate drill and all its parts, were meant mainly to demonstrate the method.

*Difference between Simon and Hendrick Stevin's architectural illustrations*

The illustration of an architectural model (ill. 17) that Hendrick Stevin devised on the basis of his father's texts for *Huysbou*, occupied a special place in 'Byvough der stedenoirdeningh'.

The model cited is one of the models made according to the aforementioned rules for the layout of houses, and currently kept at His Highness's library: which I have represented in the accompanying illustration. [Yet] being sufficiently similar to the ground plans and elevations of the previous fourth chapter, [I] have made a certain rough drawing of that model as an aid showing how the funnel roof directs the water into the rain reservoirs in the centre of the house, with each reservoir having its own roof window so that, in an emergency, it is possible to climb inside.<sup>269</sup>

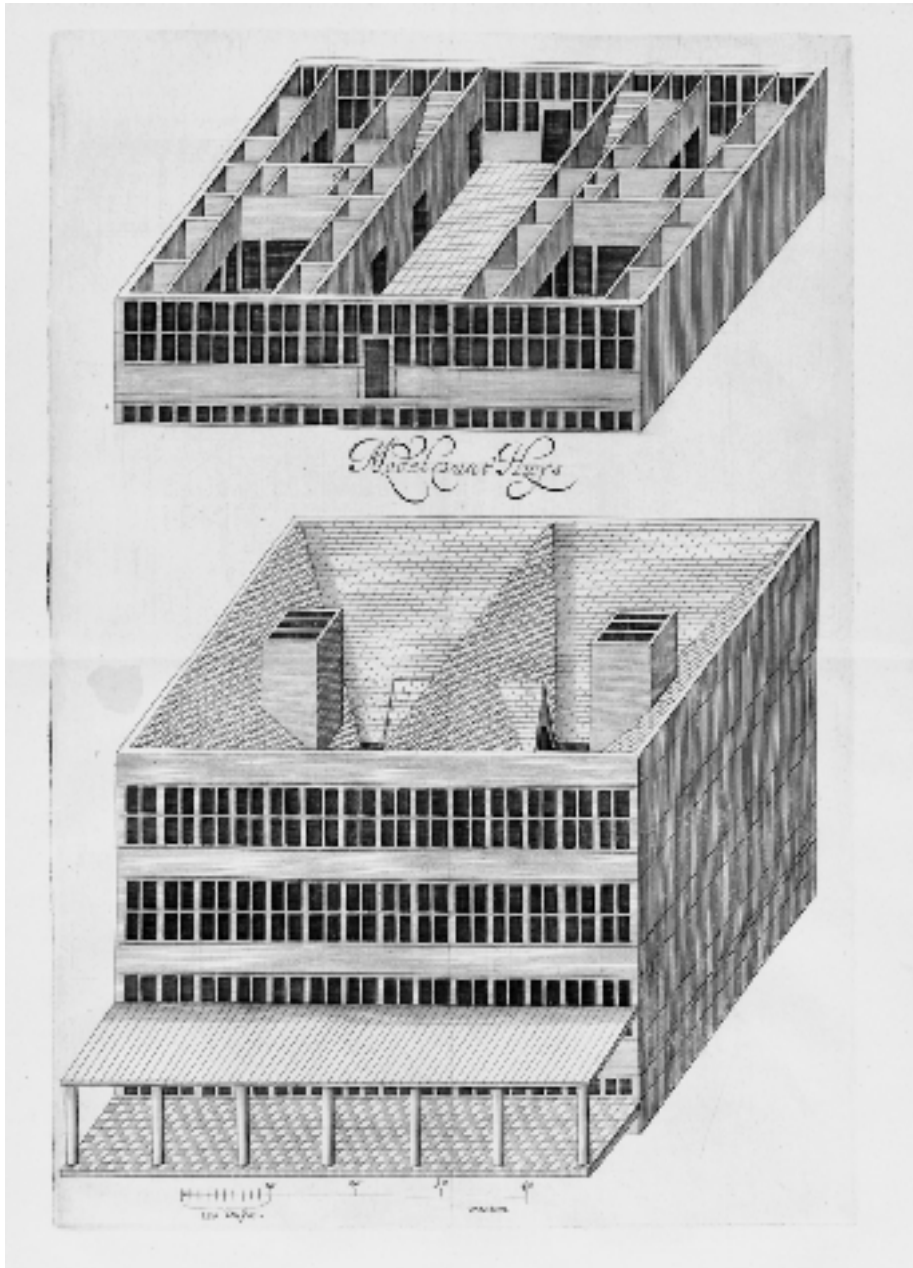
This introduction reveals that Stevin had made several models illustrating his rules for the layout of a house, one of which was still present in Prince Frederick Henry's library. Since he died before Frederick Henry succeeded Prince Maurice it was presumably through Maurice, Stevin's pupil, that the model came to the princely library. Hendrick Stevin noted that he had made a perspective drawing of this model, adding a drawing of a funnel-shaped roof as a supplement to the ground plan and elevation drawing mentioned in 'Byvough'.

According to Stevin's son, the funnel-shaped roof fitted in broadly with the plan. Yet on closer consideration, this roof, with its double opening, would have proved too bulky and complex even for a house with a 60-foot façade. The double opening, which apparently served to drain the water into the tanks, seems to have had no further visible link with the design. In short there are substantial differences between this reconstructed architectural model and the depicted plan of the house, which was also a reconstruction.<sup>270</sup> Hendrick

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<sup>269</sup> H. Stevin, 'Byvough', pp. 115-116: 'Met dit Model wort verstaen een vande Modellen na de voorschreve regelen der huysoordening gemaect, en jegenwoordich berustende op de Bibliotheek van Syn Hoogheyt: Welcker een ick verschaeut heb als deze bygaende form; Doch na de grontteyckening en stantteyckening des voorgaenden 4 Hoofsticx daer mede genouchsaem overeencommende, hebbende noch tot behulp seker teyckening int rou van haere model genomen waer in men sien can hoe het trechterdack syn waterloost inde regenbacken commende int middel vant huys, hebbende elcken regenback syn dackvenster, om des noots sijnde, daer in te connen climmen'. See appendix E, p. 496.

<sup>270</sup> Hendrick Stevin states elsewhere, for example, that his father had in fact planned the kitchen to be in the place which now shows the 'vertreckamer', *Materiae Politicae*, 'Byvough', p. 63: 'doch nadien ick de tecykeningh soo vont, hebse soo ghelaten'. See appendix E p. 494.



Ill. 17 Architectural model published by Hendrick Stevin, *Materiae Politicae* (1649) showing a reconstruction of Stevin's house based on his fathers texts and architectural models.

Stevin was probably attempting to make the best possible reconstruction of the house using available texts and his father's relatively abstract plan, which presumably showed little more than a few symbols corresponding to the principal rooms. At first he had no access to the detailed plans and so added improvised details to provide a more complete picture. He placed one reconstruction over the other to create an overall depiction of his father's private house. It is debatable, however, whether Stevin would have wished such a total illustration. For although the various models based on the rules for the layout of houses could be combined, he preferred to work out problems individually, rather than provide a synthesis – as in *Sterctenbouwing*, for example, in which he outlined three separate models for completely different purposes. Presumably, here too, Stevin used different models to demonstrate various aspects involved in building a house.

This treatment of Stevin's models suggests that his son's presentation of the illustrations should be approached with circumspection. At first sight the illustrations in *Materiae Politicae* appear to have been the same as the drawings copied from the original manuscript; yet there are some differences (cf. ills. 4 and 43). Firstly, the handwritten excerpts contained several depictions, such as the drawing of a drain running under the centre of the street, which were not included in the same text fragments in *Materiae Politicae*. Apart from these discrepancies, the illustrations in the transcripts and the printed version reveal other inconsistencies. For example, the town plan in the manuscript does not show the bridges depicted in the printed illustration in *Materiae Politicae*. Moreover, Hendrick Stevin gave the names of the public buildings in his father's town plan in full, whereas these only appeared as letters in the transcript. In the more elaborate plan of the private house in *Materiae Politicae* the rooms were named, although no drawings in other manuscripts exist with which to compare these. Hendrick's observation that he had originally located the kitchen in a different place suggests that the rooms were not individually named in that plan either, but simply indicated with letters. Using letters instead of full names was typical of the style of illustrations in Stevin's other publications. In his discourse on logic of 1585, *Dialecticke ofte Bewijsconst*, he had explicitly suggested that letters could be used to represent terms.<sup>271</sup> And while his son's additions might seem unimportant, they could have led to mistaken interpretations, as in the architecture models. Just as Hendrick Stevin combined his father's drawn and physical (lit. 'bodily') architectural examples to creating an ideal house, his embellishment of the drawings turned these into objects in themselves. They

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<sup>271</sup> S. Stevin, *Dialecticke ofte Bewijsconst*, (Leiden 1585).



became independent designs, providing complete reproductions of the entire house or town, instead of diagrams to be understood in combination with the text and other illustrations.<sup>272</sup>

Stevin did not aim to produce beautiful, artistic impressions of architecture. He preferred depictions that were reliable and provided information. His architectural representations – both plans and elevations – allowed the dimensions of the parts of buildings to be gauged, while the projection and scale were geared to the specific architectural aspects they were supposed to elucidate. Yet despite this practical approach, Stevin's drawings were not primarily intended to dictate the detail of the building. Architectural details, such as ornamentation, were optional and could be added later with other drawings. Stevin himself did not include this in his drawings of elevations to avoid disturbing the logic or order of the building. His town, with its extensions, was represented in similar fashion to clarify the configuration and development rather than the object. The urban form that finally emerged from this ordered extension had, in contrast, to be read from another extremely schematic drawing. Thus Stevin's original drawings should not be seen as independent objects with which to reproduce the imaginary ideal of a house or town. Instead Stevin's representation of architecture consisted of a series of diagrams to accompany texts, designed to illustrate the ideas and logical order which underpinned the buildings described.

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<sup>272</sup> For example the printed illustration of the town plan of itself shows that Stevin had planned bridges over the canals, and the plan of the house gives the layout of the principal rooms. In the case of the illustrations in the transcripts of Stevin's texts, however, this information can only be obtained in combination with the text. To understand the exceptional position of Stevin's architectural illustrations within the context of artistic impressions of architecture or designs/drawings for practical use compare with the examples of 17<sup>th</sup> Century architectural drawings in E. Gerritsen, *Architectuurtekeningen. De tekening in de zeventiende-eeuwse ontwerp- en bouwpraktijk in de Noordelijke Nederlanden*, [PhD, Utrecht University] 2004

## 6. Stevin's contribution to architectural theory

*Ainsi, non-seulement il possédait le rare talent de mettre les choses les plus relevées à portée du vulgaire, mais encore le désir d'être utile dominait chez lui toute autre considération dans l'étude des sciences.* <sup>273</sup>

Isaac Beeckman, Constantijn Huygens and Hendrick Stevin all drew attention to Stevin's writings on architecture in the period after his death, although they did so with different aims in mind. While this led to a fragmented view of Stevin's contribution to architectural theory, because Isaac Beeckman and Constantijn Huygens were in close touch with leading scholars abroad, they helped to disseminate Stevin's ideas. Hendrick Stevin may not have had great standing as a scholar but his attempts to print the unpublished texts also played an important part in making his father's views on architecture more widely known.

Yet any assessment of the reception of Stevin's views on architecture in the seventeenth century and of his contribution to the theory of architecture in the Low Countries and abroad is hampered, not only because the texts intended for *Huyssbou* were never published or copied as a whole, but also because Stevin often discussed various questions relating to architecture and town planning, such as civil engineering, in other works, so that his ideas reached the public by different routes. Although they were initially intended to form part of the same treatise on architecture, Stevin's views on theoretical questions and his observations on building practice, civil engineering and water control should therefore be considered separately.

*New views on aesthetics, symmetry and architectural orders:*

Perrault and Stevin

Stevin was the first architectural theorist in the Low Countries to present a fundamental critique of Vitruvianism. Some commentators, like Hans Vredeman de Vries, had tried to adapt the orders to local conditions but had never cast doubt on the correctness of Vitruvius' dimensions or their basis in nature. Stevin's observations on this subject, however, were controversial in the

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<sup>273</sup> A. Brialmont, 'Construction des maisons', *Oeuvres militaires de Simon Stevin*, p. 142.

context not only of Vitruvianism in the Low Countries but also in terms of international architectural theory.<sup>274</sup> Just how controversial is clear when these are compared with the supposedly revolutionary statements on architecture made fifty years later by the French physician and architect Claude Perrault. He designed the colonnade of the east front of the Louvre, but achieved his greatest fame writing on the theory of architecture.<sup>275</sup> At the suggestion of his brother Charles Perrault, the celebrated author of *Tales of Mother Goose* and influential secretary of Jean-Baptiste Colbert, minister of finance under Louis XIV, he became a member of the Académie Royale des Sciences in 1666, the year of its foundation. Colbert, superintendent of the Bâtiments du Roi and the driving force behind the Sun King's cultural policy, commissioned Claude Perrault to translate Vitruvius into French almost immediately after he had joined the Académie. This annotated translation, *Les Dix Livres D'architecture de Vitruve*, which appeared in 1673, was followed by various shorter and longer editions. In 1683 Perrault published his *Ordonnance des Cinq Espèces des Colonnes Selon la Méthode des Anciens*, while works dealing with physics, anatomy and other scientific topics also contained interesting references to his ideas about architecture.<sup>276</sup> His notes on Vitruvius and especially his book on the classical orders, generally regarded as Perrault's most controversial work, provoked a lively debate with François Blondel, tutor and director at the Académie Royale d'Architecture, founded in 1671.<sup>277</sup> Because of his commentaries and the debate with Blondel, Perrault has generally been presented as the first real critic of Vitruvianism and the founder of modern design.

This view was expressed at its most extreme in W. Kambartel's 1972 study *Symmetrie und Schönheit*, referring to Perrault's 'revolutionäre Theorie' and his aim, 'der Moderne die gleiche Chance zur freien Entfaltung der künstlerischen Phantasie einzuräumen',<sup>278</sup> In a critical review Wolfgang Herrmann, who wrote the authoritative *Theory of Claude Perrault*, placed Kambartel's ode to

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<sup>274</sup> This chapter is based on a paper presented at the Vitruvius congress in Heerlen on 13, 14 and 15 October 1995 and published in Dutch as 'Stevin, Beekman en Perrault: De voorafschaduwung in de Nederlanden van de "revolutie" in de Franse architectuurtheorie in de zeventiende eeuw' in: R. Rolf (ed.), *Vitruviuscongres, Vitruvianum-publicaties*, no. 1, (Heerlen 1997), pp. 52-62. Heidi de Mare who had for many years access to the manuscript of this book wrote a critical account on this chapter before it was published in her recent dissertation: *Het huis en de regels van het denken*. (Amsterdam 2003.) Since my text was already translated I was not able to comment on her criticism.

<sup>275</sup> The standard work on the architecture theory of Claude Perrault is W. Herrmann, *The Theory of Claude Perrault*, (London 1973).

<sup>276</sup> See the splendid account by A. Picon, *Claude Perrault ou la curiosité d'un classique*, (Paris 1988).

<sup>277</sup> On the debate between Perrault and Blondel see W.D. Brönnner, *Blondel-Perrault: Zur Architekturtheorie des 17. Jahrhunderts in Frankreich*, (Bonn 1972).

<sup>278</sup> W. Kambartel, *Symmetrie und Schönheit: Über mögliche Voraussetzungen des neueren Kunstbewusstseins in der Architekturtheorie Claude Perraults*, (Munich 1972), pp. 32 and 105.

the revolutionary character of Perrault's architectural theories into perspective, emphasising that Perrault relied on dogmas just as firmly as his opponents did.<sup>279</sup>

Perrault was known above all for the distinction he introduced in the concept of beauty between so-called positive and arbitrary forms. The first, *les beautez positives*, being universally recognised because they stem from absolute laws inherent in nature. In this category Perrault listed the richness of the material, the size and magnificence of the building, the precision of execution and symmetry in the sense of both proportional and mirror symmetry.<sup>280</sup> Above all, Perrault's special concern with mirror symmetry has been presented as fundamentally new in the history of architecture theory. *Les beautez arbitraires*, on the other hand, depend on the significance attached to certain proportions or forms. This means that architectural forms are theoretically possible which are not beautiful in themselves but which people may come to admire. Perrault claimed that one of its determining factors was *la force de l'accoutumance*, the power of custom or familiarity.

Perrault also discussed the degree to which it was permissible or indeed obligatory to deviate from classical proportions. This was the crux of his debate with Blondel. The latter held that, although the authority of classical authors was beyond question, optical corrections might be made in actual architecture if necessary. Perrault was no slavish adherent of antiquity. However, this was not the result of a revolutionary yearning for freedom, but of a purist view that in antiquity itself architecture had strayed from the teachings of the *anciens*. A similar purist dogmatism is evident in Perrault's attitude to optical correction. The perfect proportions in architecture were based on the human figure, yet

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<sup>279</sup> W. Herrmann, 'Walter Kambartel, "Symmetrie und Schönheit: Über Mögliche Voraussetzungen Des Neueren Kunstbewusstseins in Der Architekturtheorie Claude Perraults"', in *Architectura: Zeitschrift für Geschichte der Architektur*, (1976), pp. 75-78. In *The Theory of Claude Perrault*, (1972), Herrmann emphasised the innovative nature of Perrault's theories, particularly regarding the orders and optical corrections. The same is true of the latest publication, the introduction by A. Péres-Gómes to the English edition: C. Perrault, *Ordonnance for the Five Kinds of Columns after the Method of the Ancients*, (Santa Monica 1993), pp. 1-44. This draws interesting links between Descartes and Perrault that are also relevant to the comparison with Dutch scholars.

<sup>280</sup> Perrault, *Ordonnance*, vi: 'Il faut supposer qu'il y a deux sortes de beautez dans l'Architecture, sçavoir celles qui sont fondées sur les raisons convaincantes, et celles qui ne dépendent que de la prévention, j' appelle des beautez fondées sur des raisons convaincantes, celles par lesquelles les ouvrages doivent plaire à tout le monde [...] telles que sont la richesse de la matière, la grandeur et la magnificence de l'Edifice, la justesse et la propreté de l'execution et la symmetrie [...] Or j'oppose à ces sortes de beautez que j'appelle Positives et convaincantes, celles que j'appelle Arbitraires, parce'qu'elles dépendent de la volonté qu'on a eu donner une certaine proportion une forme et une figure certaine aux choses qui pourroient en avoir une autre sans estre difformes'.

several members of the academy of architecture, led by Blondel, maintained that Vitruvius had set out rules for adapting the proportions to place and situation. Perrault held that once the proportions had been determined, even if they did not originate in nature and were therefore arbitrary, they should not be altered.<sup>281</sup> He was thought to be virtually alone in his attitude to optical correction.<sup>282</sup>

But Perrault also owes his reputation as a forerunner of modern design method to the system he devised for the subdivision of the classical orders.<sup>283</sup> He believed that architects in antiquity had started from simple proportions based on whole numbers. He saw no reason why these should later have been replaced by more complex proportions using fractions. Instead of proceeding from a fixed module for the whole building that had to be subdivided again to determine the components, he produced a division of the chief elements of the building, the entablature, base and column, in equal units and combined with each other. These proportions were not derived from nature; Perrault claimed that by calculating a middle course it was possible to arrive at the most suitable proportions.<sup>284</sup>

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<sup>281</sup> Perrault, *Ordonnance*, VII, p. 96; quoted in Herrmann, *The Theory of Claude Perrault*, p. 93: ‘enfin de finir ce traité par un paradoxe, comme je l’ay commencé par un autre, qui appartient aussi au changement des Proportions. Car j’ay taché de faire voir dans la Préface que la plupart des Proportions de l’Architecture estant arbitraires et n’estant point du nombre de ces choses qui ont une beauté positive et naturelle, il n’y a rien qui doive empêcher qu’on fasse quelque changement aux Proportions établies, et qu’on n’en puisse en inventer d’autres qui paraissent aussi belles. Et je prétens icy que ces proportions ayant été une fois réglées, elles ne doivent plus estre changées et rendues différentes dans des Edifices différens, par des raisons d’Optique et de la différence des aspects qu’ils peuvent avoir’.

<sup>282</sup> Even Herrmann, who rejected the views of several historians who presented Perrault as a radical innovator, agreed that his ideas on optical corrections were exceptional and went much further than those of his contemporaries. Only Scamozzi, according to Herrmann, was critical of giving the entablature extra overhang, and Roger de Piles distinguished between alterations on optical grounds and for aesthetic reasons. See Herrmann, *The Theory of Claude Perrault*, p. 74: ‘All writers on architectural theory who preceded Perrault accepted as an obvious fact the falsifying influence of human vision’.

<sup>283</sup> On the revolutionary character of Perrault’s system for categorising the columns see among others, Tzonis, *Het architectonies denken*, p. 90: ‘De analyse van Perrault vormt de overgang van het amalgam van benaderingen dat in de renaissance bestond, naar een consistente rationeler ontwerptheorie, die pas in de achttiende eeuw op de voorgrond treedt’ (Perrault’s analysis marks the transition from the amalgam of approaches existing in the Renaissance to a consistent, more rational design theory which only comes to the fore in the eighteenth century).

<sup>284</sup> Perrault, *Ordonnance*, p. 33, ‘la médiocrité, que je considère comme la règle la plus certaine, pour concilier les opinions diverses et les exemples différens qui se rencontrent dans l’Architecture’ and p. 38 ‘La médiocrité doist estre choisie comme la meilleure’. Quoted in Herrmann, *The Theory of Claude Perrault*, p. 103.

Various authors have claimed that Claude Perrault was the first theorist to replace the Vitruvian concept of symmetry in the sense of a proportional correspondence between the parts and the whole by the sense in which it is used today, namely a proportional correspondence between the left and right sides, or mirror symmetry.<sup>285</sup> As these authors have acknowledged, Leon Battista Alberti had already discussed at length the beauty of the correspondence between left and right sides on the basis of human and animal forms in his *De Re Aedificatoria* of 1485.<sup>286</sup> Perrault probably even based much of his description of mirror symmetry on Alberti, as Stevin had presumably also done.<sup>287</sup>

However, these authors claimed that Alberti had not juxtaposed this correspondence with the classical concept of symmetry and had simply followed Vitruvius in his definition of the latter. Thus Perrault's innovation was to regard the correspondence between the left and right sides and the correspondence between the dimensions of a part and the whole as two different types of symmetry, and in defining absolute beauty he tried to replace the Vitruvian definition with mirror symmetry.

Wolfgang Herrmann rightly objected that Perrault viewed both concepts of symmetry as part of absolute beauty, and that the distinction between two types of symmetry was mainly intended to elucidate a problem of translation. The idea was to show that the term symmetry as defined by Vitruvius did not have the same connotation as *le mot Symmetrie en François* in Perrault's time. In this respect Stevin went further than Perrault. He decided that *saemmaticheyt* was actually a better translation of the Greek *symmetria* than *leycksjidicheyt*, but preferred the latter because the former had been wrongly used

[...] a clearer term for the concept and a more effective way of indicating the aforementioned animal-like shape of a building, and to bring this into greater usage than is now the case.<sup>288</sup>

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<sup>285</sup> See above all Kambartel, *Symmetrie und Schönheit*.

<sup>286</sup> L.B. Alberti, *De Re Aedificatoria*, (Florence 1485), IX, 7: '[...] tam ex natura est, ut dextera sinistris omni parilitate correspondeant Quare in primis observabimus, ut ad libellam et lineam et numeros et formam et faciem etiam minutissims quaeque disponatur, ita ut mutuo dextera sinistris, summa infimis, proxima proximus, aequalia aequalibus aequatissime coveniant at istius ornamentum, cuius futurae'.

<sup>287</sup> C. Perrault, *Les dix livres d'Architecture de Vitruve corrigez et traduits nouvellement en françois, avec des notes et des figures*, (Paris 1673), p. 10 note 3: 'mais on entend autre chose par le mot de Symmetrie en François; car il signifie le rapport que les parties droites ont avec les gauches, & celui que les hautes ont avec les basses, & celles de devant avec celles de derriere, en grandeur, en figure, en hauteur, en couleur, en nombre, en situation; generalement en tout ce qui les peut rendre semblables les unes aux autres'. Quoted in Kambartel, *Symmetrie und Schönheit*, p. 47. Compare Alberti's definition in the previous note.

<sup>288</sup> S. Stevin, *Huysbou*, [I-1], p. 211. Cf. H. Stevin, 'Onderscheyt van de Oirdeningh der Steden', p. 14.

In short, Stevin eschewed the more correct translation in favour of what he believed to be a clearer and more usable term. The extent to which he succeeded in giving the concept of mirror symmetry greater currency is a question in point, as is the degree to which the distinction between two types of symmetry reflected that between two types of aesthetics.

*Stevin and Beekman's several types of beauty*

Symmetry and beauty

Like Perrault, in addition to two kinds of symmetry, Stevin also distinguished various types of beauty. Stevin tried to explain the pleasure experienced when observing mirror symmetry on natural principles.<sup>289</sup> In doing so, he implicitly accepted the existence of absolute beauty. Other types of beauty resembling Perrault's arbitrary definition based on *la force de l'accoutumance* are apparent in his rather cryptic comments on the use of the classical orders. Discussing the mixing of orders, Stevin observed,

Regarding usage [...], this is certainly more powerful, and is not unjustly known as second nature; nevertheless, it can be divided into three categories by origin, those to be followed, those to be avoided and those which are a matter of choice.<sup>290</sup>

As an example of those to be followed, Stevin cited the convention that men wear men's clothes and women wear women's clothes, a rule not inherent to nature but nonetheless observed.<sup>291</sup> Among those to be avoided he included habits such as getting drunk every day. Finally, those that are a matter of choice included the dimensions of columns, which he considered not fixed by nature, and which he even compared to costumes of foreign nations that were not worn in the Low Countries.<sup>292</sup> While Stevin did not offer definitions of various kinds of beauty, he certainly assumed an implicit distinction between natural beauty and beauty based on rules, custom or familiarity.

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<sup>289</sup> Cf. chapter 2, p. 29.

<sup>290</sup> S. Stevin, *Huysbou*, 'Aenteijckeningen op Serlijns en anderen/Inhoudende sommige geschillen', cf. H. Stevin, 'Byvough', p. 109. For Stevin's comments on habit as 'ander natuer' see also the introduction to his *Dialectike ofte Benyssonst*, (Rotterdam 1621), p. 4.

<sup>291</sup> S. Stevin, *Huysbou*, 'Aenteijckeningen op Serlijns en anderen/Inhoudende sommige geschillen', cf. H. Stevin, 'Byvough', p. 109: 'Volghelicke daermen hem na gevougen moet, als dat mans geleet gaen na de gebruyck van mans, niet als vrouwen, want hoewel de natuer sulcken cleet voor de vrouwen niet eygentlick veroirdent en heeft, doch vereyscht de rede soondanige regel in een Lantschaponderhouden te worden, om de ongevallen te verhoeden die uytte contrari volgen'.

<sup>292</sup> S. Stevin, *Huysbou*, 'Aenteijckeningen op Serlijns en anderen/Inhoudende sommige geschillen', cf. H. Stevin, 'Byvough', p. 109: 'Het gaet hierme als mette form en cieraet der clederen, want gelijk

Given that various kinds of beauty existed, these would need to be continually reaffirmed. Thus in addition to studying the reasons and natural origin of positive beauty, Perrault conjectured that some objects in architecture might not be beautiful at all yet still be pleasing to the eye.<sup>293</sup> Fifty years earlier similar questions had been raised in the Low Countries. In a short eulogy on Maurice's penetrating intellect, Stevin had discussed whether his doubts about the use of an irregular order could be explained with natural reason.<sup>294</sup> The reason why it was second nature for some to consider certain things beautiful, was not discussed in detail by Stevin. However, Isaac Beekman examined the subject more closely, as evidenced in his 'Journael' notes for 1618.

I consider it an important and pleasant task to be able to discuss the rationale of proportions in architecture, namely why pedestals, columns, capitals, cornices etc require a particular proportion, as applied according to [the rules of] art, that is why, when fashioned after [the rules of] art, they appeal to the eye. That a comparison is made with a man, woman, young girl, does not satisfy me in the least, since it is obvious that the clothes are not made to the shape of the body [...] indeed, it would be interesting to discuss why so many different styles of clothes exist and why each country chooses a particular style and also frequently changes it.

To broach the subject and as a basis for further consideration, I pose the question, why does a small door look bad in a large house? Answer: because one is used to seeing doors that are taller and wider than a man of normal stature, which is something that has acquired aptness through usage, becoming a principle of architecture, making that which is ordinary appear beautiful. Because it sometimes happens that things only begin to appeal to the eye after extensive custom, so how much more so for things that are used by a whole city [...] Nevertheless, there is another reason which can be deduced from nature, like harmony in music, because eyes have a sense of what is pleasant, just as ears. Since all things that are alike on one side and on the other are beautiful, such as the human body, cut down the middle from top to bottom, the right side appearing the same as the left side etc. 'De his latiùs antè'.<sup>295</sup>

One striking aspect of Beekman's lengthy discussion is that he managed to explain the difference between the beauty of ordinary architectural works

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wij soo weynich verbonden sijnde ande verzierde drachten, van ander Volcken, als syluyden andse onsen, alsoo oock mettet cieraet der pilaren, d'een is ande droomen van d'ander niet ghehouden'.

<sup>293</sup> Perrault, *Ordonnance*, VIII: 'Il en est ainsi dans l'architecture, oï il y a des choses que la seule accoutumance rend tellement agreables quoyque'elles n'ayent en elles-mesmes aucune beauté qui doive infailliblement plaire.'

<sup>294</sup> S. Stevin, *Huysbou*, [I-1], p. 213. Cf. H. Stevin, 'Onderscheyt van de Oirdeningh der Steden', p. 16.

<sup>295</sup> De Waard, *Journal tenu par Isaac Beekman*, vol. 1, pp. 213-214. Part of this quotation may be from a later date. See below, p. 173.



that have come to be considered beautiful through *gewente* (habituation) and beauty intrinsic in nature far more lucidly than Stevin. As examples of beauty based on natural laws, Beeckman cited the analogy between harmony in music and the proportions in architecture and, significantly, mirror symmetry. This analogy between the beauty of architecture and music can be traced back to antiquity, and while Beeckman may have developed the idea of the natural beauty of mirror symmetry by another route, it is not impossible that he was aware of Stevin's theoretical views before he came to study *Huysbou*. Indeed, Beeckman used the same metaphor of the costumes of different nations to illustrate the distinction between various types of beauty.<sup>296</sup> It is even possible that the notes Beeckman added to the quotation and recorded by the copyist date from 1624, when he first studied Stevin's work.<sup>297</sup> Either way, Beeckman saw Stevin's theoretical statements about architecture as a confirmation of his own ideas. Over two years after he had copied Stevin's manuscripts Beeckman wrote,

Having spent a long time researching the reasons for the composition and ornamentation of the five orders of columns [and] having read many books on the subject, apart from Vitruvius recently also Stevin's unpublished *Huysbouw*, I cannot but conclude that what I wrote elsewhere before concerning the use, customary view and the division into two like parts, that these are the things that make a work pleasant and little else; so if, having observed the three aforementioned [aspects], one can make as many changes as one wishes, the more the better etc.<sup>298</sup>

Isaac Beeckman's three conditions for acceptable variations in an architectural object to be considered beautiful reveal his close links to Simon Stevin's writings. It was clear to Beeckman that mirror symmetry possessed natural beauty, but what mainly intrigued him was why certain objects were thought beautiful that did not possess this intrinsic quality. He therefore devised two other categories with which changes could not conflict: custom and familiarity to the eye.

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<sup>296</sup> Cf. p. 117 above.

<sup>297</sup> Part of the quotation has been inserted on a loose sheet and may only have been added to his earlier statements on this subject at a later stage after Beeckman had read the copies of *Huysbou*. It is not completely clear whether Beeckman came up with this question, which he raised in his 'Journal' in 1618, on his own account, but it would in any case explain his great interest in Stevin's *Huysbou*. This passage in the manuscript contains both the hand of the copyist who later copied large sections of *Huysbou* from 1624 and that of Beeckman himself, which may indicate later additions. The comparisons between ornament and dress would then be of a later date.

<sup>298</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 382.

## Perception and optical corrections

Why things seem the way they are is a recurrent theme in Beeckman's 'Journal'. The study of perception was a key aspect of his empirical method. While his observations related to wide-ranging scientific topics and experiments, he developed his views on how people see and the depiction of this using examples from architecture. Here again Simon Stevin's writings played a role.

Stevin's views on the visual presentation of architecture are known mainly from the passages intended for 'Deursichtighe' which appeared in *Wisconstighe Ghedachtenissen* rather than from the copies and published excerpts from *Huysbou*.<sup>299</sup> Stevin was fiercely critical of artists who attempted to correct the proportions of an object when depicting it in a painting, matching it with the perception 'by sight or guesswork'.<sup>300</sup> Stevin's 'Deursichtighe' was well-known in the seventeenth century, both in the Low Countries and abroad. In 1645 Jan Jansz Stampioen the Younger drew up a list for Christiaan Huygens of the best authors to study in various fields; for perspective he recommended Vredeman de Vries and Marolois and the treatise by Simon Stevin.<sup>301</sup> Beeckman also referred to it.<sup>302</sup> This is significant because of the clear picture it gives of the role of Stevin's work at the cutting edge of a lively debate in the Low Countries on the use of perspective and whether or not optical corrections could be made.<sup>303</sup> Thus Beeckman noted that the astronomer Philips Lansbergen, who had devised a variant of the quadrant for accurate optical observations, and his son had supported those painters who believed that since the distances between columns seemed to decrease at the extremes, they ought to be depicted as being gradually closer together. Beeckman rejected this and argued in defence of Simon Stevin's opinion that the proportions seen by the observer both of the actual columns and in the picture in which the columns were painted should remain the same and not be changed (ill. 18).<sup>304</sup>

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<sup>299</sup> Besides 'Deursichtighe' on optics, another part of 'Eertclootschrift' in the same compendium on mathematics must have caught Beeckman's attention. From it he studied a number of passages about the relations between notes. See also De Waard, *Journal tenu par Isaac Beeckman*, vol. 1, p. 29: 'tonorum inter se proportio geometrica'.

<sup>300</sup> 'Eerste bouck der deursichtighe, Vande verschaeuwung', [p. 4], published in *The Principal Works of Simon Stevin*, vol. 11 b, p. 800; see also p. 957.

<sup>301</sup> Bierens de Haan e.a. (eds), *Oeuvres complètes de Christiaan Huygens*, vol. 1, no. 5, pp. 5-10, esp. 6. On architecture Stampioen observed, 'De Architectuer is niet beter als uit Schamotius te leeren, die de beste ende bequamste proportie daer in observeert'.

<sup>302</sup> M. Kemp, 'Simon Stevin and Pieter Saenredam: A Study of Mathematics and Vision in Dutch Science and Art', *Art Bulletin*, vol. LXVIII, (1986), no. 2, pp. 237-252. For the significance of Stevin's 'Deursichtighe' in an international context: K. Andersen, 'Stevin's theory of perspective: the origin of a Dutch academic approach to perspective', in *Tractrix*, 2, (1990), pp. 25-62.

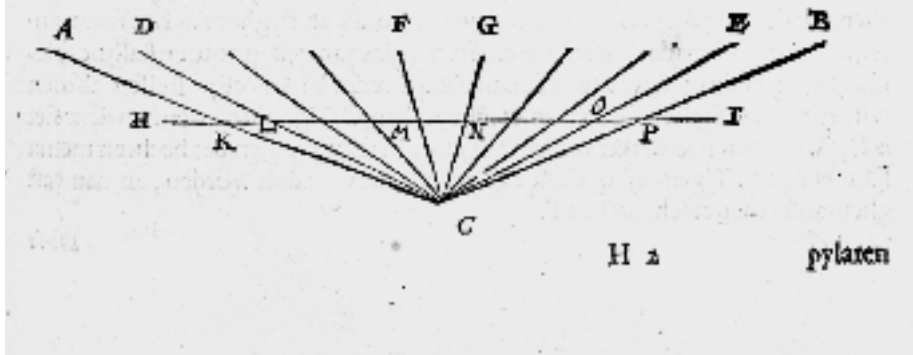
<sup>303</sup> This theme was further explored in Van den Heuvel, 'Samenspreekinghe'.

<sup>304</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. 11, pp. 248-249: 'Vincent Everdejs seyde den 6 July [1623] dat Philips lansberge met syn sone voor hem gedefendeert hebben de opinie van de schilders,

## 6 Hoofstuck vande volcommen navolging der const.

Entelicke meesters in dadelick verschauwen, houden daer voor, datmen int verschauwen niet heel volcomelick en moet navolghen de reghelen deser const, maer somwijlen wat behaghelecker voort' oogh stellen dat teghen de reghel gaet: Gheven daer af voorbeeld, segghende dat als ymant staet voor en by t' middel van een langhe ghevel met pylaren van t' een eynde tottetander, de pylaren die int middel sijn, sullen haer int gesicht veel wijder van malcander verthoenen, dan die na by de eynden staen, nochtans, segghen sy, en moetmen int verschauwen sulcke schijn niet volghen, maer soodanighe pylaren al ewewijt van malcander setten, na de ghemeene manier diemen in sulcke gheteyckende schaeuwen den gaens siet onderhouden te sijn, want soomen t' verkeerde dede, te wesen datmen die pylaren onevewijdich stelde ghelijckse verschijnen, t'soude onbehaeghlicke verschauwing sijn. Maer al dit is ghemilt, nyt oitfaeck dat sulcke pylaren inde schaeu al ewewijt van malcander ghestelt wesende, en natuerlick oogh oock t' sijnder plaats, soo krijghense van selfs de behoellicke schijnbaer naerdering die de ware verschaeulicke pylare schijnbaerlick krijgen.

Maer om hier af by voorbeeld noch claerder te spreken, laet de ondergestelde puntē mēschē A en B, beteyckenen de gronden der voortchrevē verschaeulicke



Ill. 18 Stevin's demonstration of perfect application of the art of perspective versus optical corrections by sight or guesswork, in *Eerste bouck der deursichtighe, Anhang* (1605)

Beeckman was also interested in optical corrections to actual buildings. For example, he discussed why the spires of Amersfoort and Rotterdam appeared

die segghen dat men de evenwydighe pilaeren met het glas evenverde vaneen staende, niet evenverde vaneen schilderen en moet. Ende badt my dit volgende argument te solveren, namentlyck, dat de pylaren, die verder aen den syde staen, dicht aeneen schynen te syn, daer se nochtans op onse maniere so verde vaneen geschildert werden als de middelste. Hierop antwoorde ick tot defentie van de opinie van Simon Stevyn, datter int schilderen altyt proportie gehouden wordt tusschen de verte van het oogh ende dadelicke pylaren, gelyck tusschen de verte van het oogh ende geschilderde pylaren?. See also *ibid.*, vols. 1, p. 29 and II, p. 265.

from a distance to be too small.<sup>305</sup> He noted that in principle this effect could be corrected by adjusting the proportions. He took these observations a step further, concluding that at a certain distance the steeple would appear at its best when viewed upside down, against all the rules of statics.<sup>306</sup> In effect, the proportions could be seen correctly from only one point, from which he deduced that it made little sense making optical corrections. However, at the request of Rotterdam carpenter Abraham Willemsen of Collegium Mechanicum, Beeckman rearranged the balls on a chain holding a chandelier – probably for a church in Rotterdam – so that they would appear equidistant from the building’s principal vantage point.<sup>307</sup> Since it would normally be impossible to determine the best point from which to view a building, Beeckman argued that the proportions should be based on the form of the object itself rather than the vantage point, which was the principle on which he calculated the proportions of steeples.<sup>308</sup>

Beeckman noted that Abraham Willemsen, who had measured several spires, had established that the height of the brickwork was four times the width of one side of the square of the tower. On these proportions Beeckman observed that, ‘four split in half [...] is two on either side, which is twice the width, as the lengths are equal and made alike to the eye, which is pleasing to see: a pleasant dichotomy’.<sup>309</sup> By the latter term, normally used to present aspects of a scientific question in pairs of concepts, Beeckman clearly meant the pleasingly symmetrical arrangement based on logical rules inherent in nature.

This form of beauty also required a certain familiarity with the object. Whereas the ancient and Renaissance theorists based their rhetorical description of the perfect proportions of symmetrical, ordered architecture, equal to

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<sup>305</sup> Ibid., vol. II, pp. 154-155 and pp. 348 and 359.

<sup>306</sup> Ibid., p. 155: ‘Tis wel also dat den toren van ooghe af opwaers verdunnen moet, omdat de reden lert dat het dickste het dunste behoort te draghen, maer nochtans om de vercleyninghe ordentlickst te maken, so en kander voor de ooghe gheen beter gelyckheyt gevonden worden, dandat een toren, die na boven toe verdickende de ooghoeken even groot maeckt, omgekeert wort, twelck de imaginatie genoegh bemercken kan, ende vindt daer een gelyckheyt in, te weten van een proportionele verminderinghe van de hoecken. Maer hieruyt volcht dat eenen toren van een seker distantie aldercierlickst schyndt, te weten vandaer men de hoecken even groot hebben soude, waert dat den toren gekeert ware’.

<sup>307</sup> Ibid., pp. 359-360. Abraham Willemsen, sometimes referred to as a carpenter, sometimes as a mill builder, took part in Beeckman’s Collegium Mechanicum.

<sup>308</sup> Beeckman says that the system of proportions used in the construction of many church towers, such as that of Rotterdam, is based according to Abraham Willemsen on the square of the circle, and then tries to explain why this system appears beautiful: ‘de dichotomia is aengenaem’ (the dichotomy is pleasing). He adds that pedestals are also designed according to this system. See *ibid.*, p. 348, as well as pp. 154-155 and 359.

<sup>309</sup> Ibid., p. 348.

God's creation, on the human body, Beeckman held that *pulchritudinis in homine ratio* and that the appreciation of beauty resulted primarily from frequent observation and familiarity.<sup>310</sup>

The common denominator

Beeckman examined *gebruyck* (custom) in relation to the five architectural orders, noting that he first used *Huysbou* and only later Vitruvius.<sup>311</sup> Stevin had dealt on the point only briefly, but his remarks proved valuable. He denied that the orders originated in nature and allowed combinations of orders and dimensions, particularly since even the ancient architects had not always followed their own rules. More generally, Stevin had pointed out the need for more observations for progress in science and art. This empiricism played a major part in Beeckman's explanation of the origin and beauty of the orders:

Just as there are few works as excellent as those made at Ephesus, Corinth and the first Doric etc, made by a good master after due consideration, not because no other way was permitted, but because he thought it was good and he had seen many other buildings which were not good – since these excellent buildings pleased the people, the builders took their measurements from them and were afraid to do anything other than had been done there; indeed, not even daring to mix when something excellent was built. Which is hardly surprising; they had to be certain since their honour was at stake.

So this is the origin of the division into five columns, and had there been more excellent works, of which the various [writers] in Greece who began writing descriptions in those days knew nothing, there would have been even more columns.<sup>312</sup>

Beeckman therefore held that the orders resulted from the views of architects and not from ineluctable rules inherent in nature. He felt they were the product of a lengthy process in which good architects learned from poor examples. In short, Beeckman believed not in natural origins and beauty but in gradual development by trial and error based on observation that had eventually resulted in five orders because at the time of codification no others of

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<sup>310</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. I, pp. 240-241, 'pulchritudinis in homine ratio', where Beeckman argues that the most attractive person is the one whose bodily proportions are those most often seen. He proceeds from 'gestelde' – proposed – dimensions which he tests against others. 'Want elc conditie wort meest gesien in de menschen. Die dan daerby een mont heeft en de conditie, die men meest gewoon is te sien, en soo vorts alle de leden van het aensicht, en so vorts alle de leden van het lichaem, dat wort een fraye mensche geacht, want hy is vol van gestaltenisse, die men meest gewent is te sien'.

<sup>311</sup> *Ibid.*, vol. II, p. 382.

<sup>312</sup> *Ibid.*, p. 382-383.

comparable quality were known.<sup>313</sup> Perrault's view that the middle course provided the best rule, later linked to Descartes' dictum, is therefore found much earlier in Stevin and Beekman.<sup>314</sup>

Even more striking than the similarity of their theoretical views is the similar scientific approach of Stevin, Beekman and Perrault. They did not make statements in isolation, unlike Alberti, who drew no consequences regarding the Vitruvian tradition from his distinction between different kinds of symmetry. Their conclusions led them to new theories, casting doubt on the authority of the ancients. Architecture was no longer a sacred art only to be attained through ancient rules; instead it became a science to be approached empirically. Stevin and Isaac Beekman made observations that were later developed by Descartes into a completely new philosophy of science. This largely determined Perrault's ideas on scientific issues, including architecture. Indeed, the fact that Perrault's ideas on architecture may have been indirectly derived from Beekman and Stevin's notes sheds new light on the dissemination of Stevin and Beekman's ideas.

#### *Constantijn Huygens's 'gelijksydighe' stables*

Unlike Stevin and Beekman, Constantijn Huygens does not appear to have been interested in debating Vitruvius' descriptions of the dimensions of columns. Huygens wished to have the most correct dimensions and certainly not an average of the extremes presented in the various architectural treatises as Perrault suggested.<sup>315</sup> Surviving texts from Huygens's estate contain illustrations of orders by various authors placed side by side without comment.<sup>316</sup>

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<sup>313</sup> Although Beekman and Stevin both held that the classical orders did not originate in nature, they seem to have had slightly different attitudes to antiquity. Stevin referred to an Age of Sages preceding the Greeks, who still preserved some values or even 'secrets' from that time which were later lost; in his view these needed to be rediscovered. Beekman believed in the importance of the Greek period but also in the improvements in the arts and sciences made since then.

<sup>314</sup> On the relation between Descartes and Perrault on this point, see Herrmann, *The Theory of Claude Perrault*, p. 104. The dictum Herrmann refers to is found in Descartes', *Discours de la Méthode*, in *Oeuvres*, (Paris 1897-1913), p. 23: 'Et entre plusieurs opinions esgalement receues, je ne choisissois que les plus moderées: tant a cause que ce sont tousiours les plus comodes pour la pratique & vrayaemblablement les meilleures, tous excés ayant coustume d'estre mauvais'.

<sup>315</sup> See Perrault, *Ordonnance*, p. 33: 'pour concilier les opinions diverses et les exemples différens qui se rencontrent dans l'Architecture [...]', quoted in Herrmann, *The Theory of Claude Perrault*, p. 103.

<sup>316</sup> The Hague, KB, K.A., XLVIII, fol. 478.

Huygens's requests in 1635 in letters to Daniel Heinsius, Joachim de Wicquefort and Johan Albert Ban (Bannius) for different editions of Vitruvius's *De Architectura* suggest that his interest was primarily philological.<sup>317</sup>

Je [...] prens plaisir à sçavoir en theorie, ce que la pratique ne me demandera jamais. cela me fait rechercher tous les bons textes de Vitruve et tous les commentateurs che'egli s' è terato adosso.<sup>318</sup>

Huygens's remark seems to reveal a purely theoretical interest in architecture, in contrast to Stevin and especially Beeckman. But he was also a patron and a builder. Here too Stevin's writings on architecture played a special role.

In addition to acting as architectural adviser to Frederick Henry and John Maurice of Siegen, Huygens was also involved in designing and overseeing the construction of his own residence between 1634 and 1637.<sup>319</sup> Kamphuis suggested in 'Constantijn Huygens, Bouwheer of Bouwmeester?' that by building this house Huygens hoped to clarify the contradictions in the various treatises on the orders.<sup>320</sup> But it is doubtful whether this was his main motive. All the same, it is hardly coincidental that, shortly before the start of construction in 1635, he requested several editions of Vitruvius, and that after completion of the house personifications of the Vitruvian triad of *firmitas*, *utilitas* and *venustas* adorned the tympanum. Huygens's profound interest in theoretical writings on architecture during these years cannot be separated from his involvement in the building of his house. Indeed a remark by Caspar van Baerle in 1639 in a letter to their mutual friend Joachim de Wicquefort notes significantly,

[...] j'ay vu&visité sa maison on peut dire estre bastie selon les règles de Vitruve.<sup>321</sup>

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<sup>317</sup> J.A. Worp (ed.), *De briefwisseling van Constantijn Huygens*, vol. II, pp. 53-54: nos. 1087 and 1088 and p. 182: no. 1417. In 1634 he says he is already busy with Vitruvius, but he does not say in what respect. See *ibid.*, vol. I, p. 454 no. 896.

<sup>318</sup> *Ibid.*, vol. II, p. 54, no. 1088. Here Huygens says he has asked for editions of Fra Giocondo, Cesariano, Caporali, Barbaro and Baldi. He prefers to read Alberti in the original Latin.

<sup>319</sup> J.H. Plantenga, 'Constantijn Huygens en de Bouwkunst', in *Verzamelde opstellen*, vol. I, (Amsterdam 1926), p. 25-34; G. Kamphuis, 'Constantijn Huygens, bouwheer of bouwmeester?', in *Oud Holland*, 77, (1962), pp. 151-180. F.R.R. Blom, H.G. Bruin/ K.A. Ottenheim, *Domus: het huis van Constantijn Huygens in Den Haag*, Zutphen 1999.

<sup>320</sup> Kamphuis, pp. 151-180, pp. 165-166: 'De interpretaties zijn echter verward [...] Huygens meent dan, dat door een voorbeeld een beslissing gebracht moet worden. Daarom heeft hij de gelegenheid aangegrepen zich een huis te bouwen' / 'It was unclear, however, how it should be interpreted [...] Huygens took the view that the issue should be settled by means of a model. This is why he took the opportunity to build himself a house'.

<sup>321</sup> *Lettres de M.J. De Wicquefort avec les reponses de M.G. Barlee*, (Amsterdam 1696), Lettre no. III, pp. 94-95, dated 13 June 1639.

Huygens consulted theoretical writings on architecture while building his house, and used what he learned to contribute to this theoretical discussion. This is evident from the remark ‘instruendae meliori Architecturae’ in his notes for the poem *Domus*, which he had begun in 1639 and which he intended to conclude with a passage on writers on architecture and a commentary on how to write about this subject.<sup>322</sup>

It may have been Huygens who asked Hendrick Stevin in January 1636 for permission to consult *Huysbou* (ill. 19). The fact that this request did not immediately follow Huygens’s series of requests for editions of Vitruvius the year before is probably explained by the long period, from 18 May to 20 December 1635, during which Huygens left the building of his house to go on campaign; the first contacts with Hendrick Stevin probably date from that time.<sup>323</sup> Unfortunately, it is unclear whether Huygens planned to include Stevin among the writers on architecture to be discussed at the end of *Domus*, although he mentioned Stevin in the poem and employed terms to describe his house that seem to be borrowed from *Huysbou*.

After a passage following a reference to a remark by Stevin about *wellsand* (quicksand), which may of course have come from another work, such as ‘Eertclootschrift’, he clearly derived the terminology in the next sentence from Stevin’s remarks about symmetry in *Huysbou*:

Eodem anno equile extractum, gelycksydigh, sed non accuratis membris ut postea.<sup>324</sup>

It is remarkable that Huygens employed the Dutch term *gelycksydigh* in the middle of this Latin sentence. By choosing this rather than *symmetria*, which might have been expected, Huygens was obviously referring to Stevin’s concept

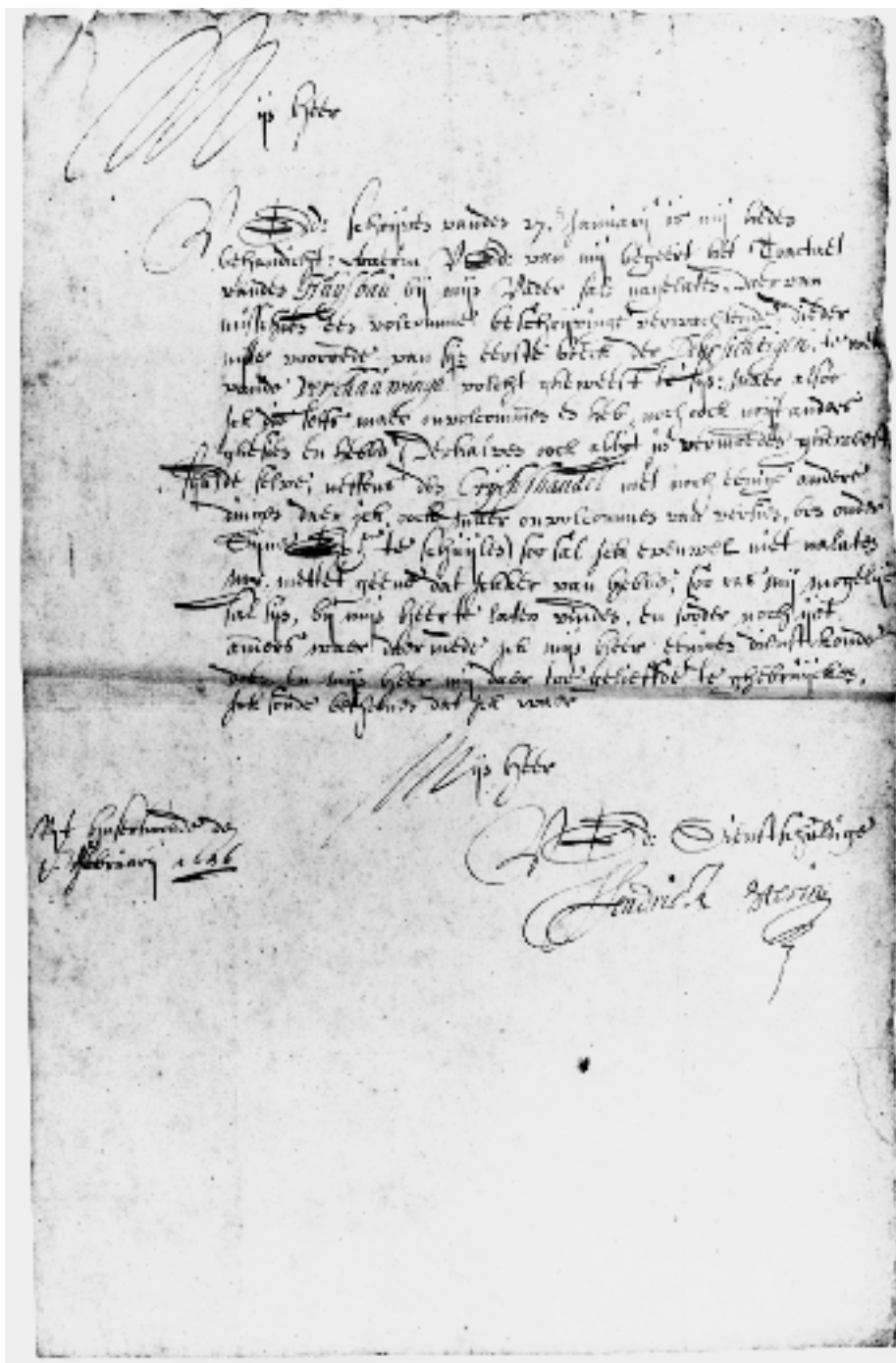
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<sup>322</sup> C. Huygens *Domus*, (The Hague), KB KA, XLVIII, fol. 733 r.-745 v. and 748 v; Kamphuis, ‘Constantijn Huygens’, pp. 151-180, esp. 179: ‘Tot het onderwijzen van een betere architectuur’. Concluding the passage: ‘de scriptortib. Archit. Indicium. qui scribendum’. The text of this book was already translated before the excellent Dutch edition of *Domus* by Blom, Ottenheim and Bruin came out. Therefore I could not make use of this edition for my text. Nevertheless for more information on *Domus* I refer to: F.R.R. Blom, H.G. Bruin/ K.A. Ottenheim, *Domus: het huis van Constantijn Huygens in Den Haag*, Zutphen 1999.

<sup>323</sup> For a more detailed discussion see ‘The History of the Huysbou’, below, pp. 152. J.H.W Unger (ed.), *Dagboek van Constantijn Huygens*, (Amsterdam 1885), pp. 26-28. In his treatise “‘Eenighe stucken der Crychconst’” beschreven deur Simon Stevin’ Hendrick says that in 1635 he received from the lord of Brederode, Johan Wolpherd, one of Frederick Henry’s troop deployments. Hendrick Stevin served from 13 January 1633 as quartermaster in the regiment of the lord of Brederode and evidently knew him personally. The same lord of Brederode maintained close relations with Constantijn Huygens and may have brought it to his attention during the 1635 campaign that Hendrick possessed excerpts from manuscripts of Stevin’s *Huysbou*.

<sup>324</sup> Huygens, *Domus*, quoted in Kamphuis, ‘Constantijn Huygens’, pp. 151-180, p. 179.





Ill. 19 Letter of Hendrick Stevin (1636) to Constantijn Huygens ? in answer to lost request to consult the manuscripts of *Huysbou*. Bruges, Stadsarchief

of mirror symmetry. Discussing columns, Huygens remained loyal to the concept of symmetry as defined by the architectural theorists of antiquity and the Italian Renaissance, but in his descriptions of ground plans he distanced himself from it. In *Domus* Huygens noted that, following his wife's suggestion, the original square plan was abandoned, enabling them both to make better use of the house.<sup>325</sup> In the end the house was rectangular in shape and the interior design based on mirror symmetry.<sup>326</sup> Finally, Huygens described mirror symmetry as the ordering principle behind his country house Hofwijck (ill. 20) in the poem named after it:

There is one middle line that divides Hofwijck in [two] parts. The left being indistinguishable from the right:

One east and one west lane, one island east, one west, identical paths in both;  
 An orchard in the middle, a square, a house, a pond,  
 To the south, on the Vliet, an open pavilion.

This together (cost what it may) weighed in gold, so that the tongue was in the house and both scales equal<sup>327</sup>

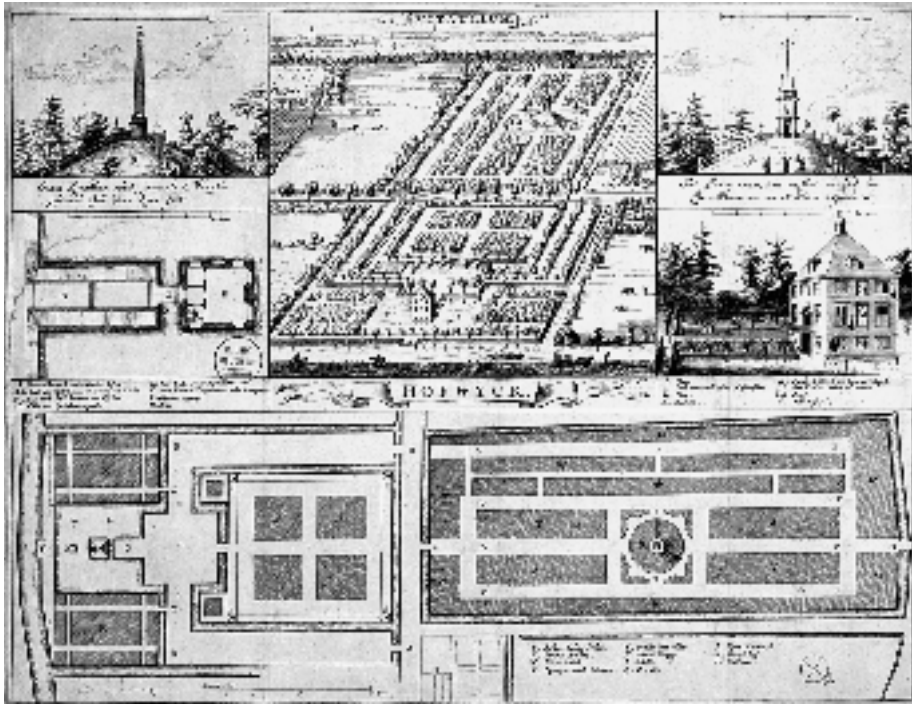
Huygens's use of *gelycksydigh* in *Domus* was therefore not an isolated instance. The design of Huygens's house, abandoning the square plan and hence presumably also four-way symmetry, and the explicit reference to mirror symmetry in his poem *Hofwijck*, indicate that he had adopted this innovative principle in his residence alongside the proportional symmetry of Vitruvius' rules for the columns and referred to it by a specific term. The mirror symmetry of the plan presented fewer constraints in the interior than four-way symmetry, enabling the design of the house to meet the requirements of the occupants without infringing the laws of aesthetics.<sup>328</sup> Nevertheless, the change in contour did not mean a change to the proportions of the ground plan. That is why Huygens continued the passage about the plan noting that the architectural rules and the system of proportion should be visible *et totius domus*

<sup>325</sup> Huygens, *Domus*, quoted in *ibid.*, pp. 151-180, p. 180.

<sup>326</sup> It is interesting in this connection that in other projects where he acted as an adviser Huygens would also abandon four-way symmetry, as in the Huis Ten Bosch. On this see J.J. Terwen, 'Mag de bouwkunst van het Hollands classicisme "palladiaans" genoemd worden?' in *Nederlands Kunsthistorisch Jaarboek*, 33, (1983), pp. 169-189, esp. 179.

<sup>327</sup> P.J.H. Vermeeren (ed.), *Constantijn Huygens' Hofwijck*, (Wassenaar 1967), p. 39. Huygens does refer here to Greek sources.

<sup>328</sup> Willem Goeree makes the following interesting remark: 'de konstwetten, segt d'heer Huijgens magmen wel watt buijgen, maar niet breecken'; see Goeree, *D'Algemeene Bouwkunde*, (KB, The Hague, 68 B 11D [1679], fol. 23v). See C. van den Heuvel, 'Willem Goeree (1635-1711) en de ontwikkeling van een algemene architectuurtheorie in de Nederlanden', in *Bulletin van de Koninklijke Nederlandse Oudbeidekundige Bond*, vol. 96, (1997), 5, p. 161.



Ill. 20 Hofwijck, Design of garden and estate, Leiden University Library, Collection Bodel Nijenhuis

*ratio exponenda*.<sup>329</sup> In fact this question of variety within accepted norms had already been raised by Stevin and subsequently by Beeckman. In his introductory chapter on mirror symmetry Stevin derided those who rejected symmetry and who claimed variety was the spice of life.<sup>330</sup> In the same section, he refuted Serlio's Stoic criticism of the lack of four-way symmetry in the Baths of Diocletian, and added that the façade of a building could differ from the back provided these kept the same shape and size. Stevin also accepted a certain degree of variety in his model town and the arrangement of the rooms within a house, provided the requirement of mirror symmetry was met.<sup>331</sup> Beeckman's motto 'orderly change ensures lasting pleasure' reflects a greater emphasis on the aesthetic qualities of variety, although he too believed that this should not

<sup>329</sup> Huygens, *Domus*, quoted in Kamphuis, 'Constantijn Huygens', pp. 151-180, p. 180.

<sup>330</sup> S. Stevin, *Huysbou*, [I-1], p. 209. Cf. H. Stevin, 'Onderscheyt van de Oirdeningh der Steden', p. 15.

<sup>331</sup> Besides the plans of the town and the various dwellings, there is an interesting remark in Beeckman's 'Journael', fol. 231 v. lines 1-3, which repeats Stevin's statement that, since an animal is not the same from the front and the back, the front and back of a house may also vary.

conflict with the principle of mirror symmetry.<sup>332</sup> These comments by Stevin and Beeckman on the degree of variety acceptable within the regular plan not only help explain Huygens's writings on architecture but also suggest the need for a re-examination of Dutch classicism, which has been linked in the past exclusively with authors from antiquity and the Italian Renaissance.<sup>333</sup>

*Stevin's views on aesthetics and symmetry in international architecture theory*

The surviving notes by Huygens relating to Stevin's writings on architecture may be far shorter than the transcripts and commentaries of Hendrick Stevin and Isaac Beeckman; nevertheless, the fact that Huygens possessed copies of *Huysbou* might reflect an interest in Stevin's ideas and suggests a possible bearing in an indirect way on the theories of Claude Perrault. Although Stevin's and Beeckman's views on architecture correspond to some extent with those of Perrault, the latter made no specific reference to the Dutch scholars. If he was acquainted with Beeckman's, and hence with Stevin's ideas, it can only have been indirectly through the works of Descartes and Mersenne, both of whom were close friends of Beeckman, even lodging with him when they visited the Low Countries.

Perrault's views on sight were based not only on his own anatomical and physiological research but also on Descartes' studies of optics.<sup>334</sup> This is relevant in that Beeckman's ideas on hydrostatics, music theory and optics had made a deep impression on Descartes when he stayed with him in 1618. He visited him again in 1628 before settling in the Low Countries for over

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<sup>332</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 300: [in margin] 'Oculus et aures quid maximè delectet', 'Hetgene dat de ooghen ende ooren behaeght, is alleen de gelyckvormicheyt want een rechte liny is frayer dan een cromme, sonder seker ende aenmerckelicke order getrocken. Laet oock eenen hoop menschen in een rechte liny staen, het sal aerdich syn, ende noch aerdicher, indien d'een ende d'ander soveel aen d'een syde als aen d'ander syde uytloopt, also dat hy den meesten tyt in die liny staet. Want de ordentlicke veranderinghe maeckt de geduericheyt des vermaeckx. Maeck dan een cirkel of eenighe andere ordentlicke figure van menschen, ende de laetse in die order voortloopen, of uyt ende in, het sal een soorte worden van vermakelicken dans. Wat is dit anders dan tgene van de lieflickheyt der musycke ende architecture te vooren van my geseyd't'.

<sup>333</sup> Of course mirror symmetry was regularly mentioned in the Italian treatises on architecture such as that by Palladio. The difference is, however, that Huygens explicitly cites the term 'gelyckseydigh' and thus assumes a distinction between two different concepts of symmetry: the proportional symmetry he applies to the orders and the mirror symmetry to the ground plan.

<sup>334</sup> R. Descartes, *Discours de la Méthode pour bien conduire la raison et de trouver la vérité; Plus la Dioptrique*, (Leiden 1637). On the influence of Perrault's physiological and anatomical research on questions of mechanics and architecture, see A. Picon, *Claude Perrault ou la curiosité d'un classique*, (Paris 1988). Beeckman's research into visual perception was also partly based on studies of the working of the eye itself. For various references see the general index in De Waard, *Journal tenu par Isaac Beeckman*, vol. IV, under 'l'oeil'.

twenty years.<sup>335</sup> In fact it was during Descartes's first visit that Beeckman recorded his initial observations about architecture, while during his second visit Descartes would have been able to consult the copies of Stevin's manuscripts and Beeckman's commentaries on them in his 'Journal'.<sup>336</sup> Descartes, who was working on studies of algebra and geometry at the time, would no doubt have expressed an interest in the unfinished manuscripts by the celebrated mathematician. Moreover, Descartes referred in letters to Stevin's *Spiegelbeling der Singconst*, a manuscript found amid Beeckman's transcripts from *Huysbou*.<sup>337</sup> In addition, like Stevin in his account of the Age of Sages and 'Radenoirden', Descartes used the metaphor of building and compared constitutional reform to town planning in his *Discours De La Méthode* of 1637.<sup>338</sup>

Like Descartes, Mersenne, who visited Beeckman in August 1630, copied various notes, particularly those on music, from his host's 'Journal'.<sup>339</sup> He too would have seen Stevin's *Huysbou* notes among Beeckman's excerpts from the music treatise. Mersenne may have referred to these in his lost request to Huygens for more information about wells, eliciting the latter's proud boast that he had manuscripts by Stevin in his possession.

Just as French scholars like Descartes and Mersenne visited Beeckman, so Dutch scholars stayed with their colleagues in France. Several years before the founding of the Académie des Sciences in 1666, Christiaan Huygens, who had inherited his father Constantijn's collection of Stevin manuscripts, was in

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<sup>335</sup> On the relations between Beeckman and Descartes, see Van Berkel, *Isaac Beeckman*, pp. 292-301.

<sup>336</sup> In 1625-1626 Descartes was working on a lost manuscript on algebra. De Waard, *Journal tenu par Isaac Beeckman*, vol. IV, pp. 135-139.

<sup>337</sup> Stevin's treatise on music was first published by D. Bierens de Haan, '*Vande Spiegelbeling der Singconst*' et '*Vande Molens: Deux traités inédits*', (Amsterdam 1884). R. Rasch (University of Utrecht) is preparing an edition in English in which attention is paid to the correspondence between Huygens and Descartes on Stevin's '*Vande Spiegelbeling der Singconst*'. He was kind enough to let me see the manuscript. On p. 104 reference is made to a letter from Descartes to Huygens of 1 November 1635 from which it appears that he must quite recently have become acquainted with Stevin's theories about music. On the criticism of Stevin see also L. Roth (ed.), *Correspondence of Descartes and Constantyn Huygens 1635-1647; edited from the manuscripts now in the Bibliothèque Nationale formerly in the possession of the late Harry Wilmot Buxton, F.R.A.S.*, (Oxford 1927), p. 55.

<sup>338</sup> Descartes, *Discours de la Méthode*, second section, *discours* 11 and 13-14. In the 1637 edition of this work three treatises dealing with geometry, meteors and dioptrics were added. In the previous year Frans van Schooten the Younger drew the figures for the last two of these texts and made a Latin translation of Descartes' '*Geométrie*'. In 1635 Frans van Schooten the Younger took over the lessons at Duytsche Mathematique after the death of his father. The special relation between Descartes and Van Schooten may also have contributed to a particular interest in Stevin's writings.

<sup>339</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. III, pp. 160-163. Before visiting Beeckman, Mersenne had also been to see both Descartes and Golius, who may have already had in his possession at that time the texts about mills and possibly other manuscripts by Stevin.

touch with Perrault and regularly stayed at his house in Viry.<sup>340</sup> Huygens and Perrault examined the widest possible range of scientific subjects, as well as maintaining a common interest in architecture. Together they tested all kinds of devices at Viry, experiments to which Perrault later referred in the tenth book of his translation of Vitruvius.<sup>341</sup> Moreover, Huygens frequently corresponded on the subject of architecture and Perrault kept him abreast of his debates with Blondel.

[...] au reste je suis bien aise que vous ne soyez pas du sentiment de Monsieur Blondel à l'égard de l'adoration aveugle qu'il veut que l'on ait pour les anciens et je ne doute point que vous ne désaprouviez la manière dont il me traite dans ses cours d'Architecture.<sup>342</sup>

Perrault clearly assumed that Huygens was equally averse to the slavish imitation of the ancients in architecture.<sup>343</sup> In fact, at that time only scientists like Beekman and Stevin had questioned the authority of classical rules of architecture in the Low Countries. Huygens presumably referred to these authors in his discussions with Perrault on the debate with Blondel, particularly since he possessed texts by Stevin on the subject. Naturally, this falls far short of proving that Perrault based his views on architecture on either Stevin or Huygens. Nonetheless, apart from the distinction between the two types of symmetry, which Perrault may also have borrowed from Alberti, Stevin and Beekman both remarked on the ability of habituation to induce an appreciation of beauty, both objected to a slavish imitation of the ancients and to optical corrections, and both emphasised the need for empirical research to

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<sup>340</sup> This is apparent, for example, from the fact that in 1663 Christiaan Huygens was to give a lecture at the Royal Society in London on the drilling in Amsterdam in 1605 which was based on Constantijn's notes on Stevin's description of this event.

<sup>341</sup> On the relation between Perrault and Christiaan Huygens see J. Barchilon, 'Les frères Perrault à travers la correspondance et les œuvres de Christian Huygens', in *XVII<sup>e</sup> Siècle*, (1962), pp. 19-36. The fact that shortly after becoming a member of the Royal Society in London Christiaan Huygens gave a lecture on drilling wells based on his father's excerpts from the work of Simon Stevin shows that he was familiar with parts of the *Huysbou*.

<sup>342</sup> Cf. letter from Claude Perrault to Huygens of 26 August 1684 in Bierens de Haan e.a. (eds), *Oeuvres complètes de Christiaan Huygens*, vol. VIII, p. 531. Worp pointed out the resemblance between Christiaan's attitude and that of Stevin as to the relation between the ancients and the moderns, which comes down to a belief that the former already knew methods which were merely developed anew by the latter; see *ibid.*, vol. XXII, p. 438 and n. 2.

<sup>343</sup> Huygens was, for example, critical of Perrault's reconstruction of a ballista from the tenth book of Vitruvius, see letter from Huygens to Leibnitz, 24 August 1690, in *ibid.*, vol. IX, p. 471: 'Je souhaite fort de voir ce Vitruve de M. Auzout, qui a raison de reprendre M. Perrault en plusieurs choses, par exemple en la construction de la Balliste, ou il nous a forgé une machine de sa teste, qui n'est point practicable, au lieu de la vray'.

find an acceptable middle course. It is the combination of these ideas in Perrault's theoretical works on architecture which suggests that he was somehow aware of the views expounded in the Low Countries. He clearly believed he could count on the support of Christiaan Huygens. What Huygens and Perrault talked about at Viry may never be known for certain. But even if the theoretical views of scholars such as Stevin and Beeckman were not his direct models, Perrault presumably regarded what he heard from the Low Countries as a confirmation of his own ideas and it is clear that over fifty years before Perrault's own revolutionary statements, similar views were being defended in the Low Countries.

*Stevin's works on water in town and house*

It was mainly from Huygens's copies of Stevin's *Huysbou* that scholars in other countries learned about the drilling of a deep well in 1605 at Amsterdam's Oudemannenhuis, although short printed accounts also circulated.<sup>344</sup> The drilling had not been carried out by Stevin, but his description provided a clear scientific basis for the experiment. In addition to being presented in London by Christiaan Huygens, Stevin's account of *bornputten* (well drilling) received special attention in Mersenne's work on hydraulics.<sup>345</sup> However, the passage on well drilling was by no means the only section connected with water in Stevin's writings on architecture to attract attention at home and abroad.

Even before he copied large parts of Stevin's *Huysbou*, Beeckman had been concerned with similar matters. He was clearly interested in the debate about the architectural orders, symmetry and the authority of the ancients; he also took a keen interest in the rendering of architecture. But in addition to these theoretical issues, their approach to building practice and hydraulic engineering was also similar.

Like Stevin, who had secured patents in this field, Beeckman studied ways of supplying water to towns with watermills. He devised a system whereby a tank was pumped full at low tide and retained enough water until high tide to feed a fountain in the town.<sup>346</sup> On a smaller scale he developed a domestic

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<sup>344</sup> According to his note on a short passage, however – 'dit volgende uijt het gedruckt briefje daer van uijt gedaen' – at the time of Huygens's description there must also have been a short printed pamphlet in existence, it was above all his manuscript that was used in the international correspondence. Only later is the account of the drilling regularly found in the topographies of Amsterdam by Fokkens, Van Domselaer, Commelin and Waegenaeer.

<sup>345</sup> M. Mersenne, *Cogitata, physio-mathematica*, (Paris 1644), 'Hydraulica, Pneumatica, Arsque navigandi, Harmonia theorica, practica et Mechanica phenomena', Prop. 53: 'Fontes et puteos invenire et cisternas construere', pp. 217-221.

<sup>346</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. 1, p. 37 'Fontes facere in urbibus' and 'Pompen beter te maecken'.

water supply employing improved pumps as well as systems for drains and chimneys.<sup>347</sup> He tackled each problem with a consistent scientific approach, presenting practical solutions. In fact Beeckman referred to the same authors as Stevin, including Vitruvius and Cardanus,<sup>348</sup> so that both the questions Beeckman considered and his approach to them corresponded closely to those in *Huysbou*.

Even before 1624, the year in which he first examined *Huysbou*, Beeckman was already familiar with other works by Stevin as Beeckman's account of a dispute about an invention for scouring the harbour at Middelburg shows. A certain Daniel Note was to present his invention to the town council in exchange for the enormous sum of thirty-six thousand guilders, on condition that it worked.<sup>349</sup> However, the burgomasters consulted Domenicus Melckebeke, who came out against the invention, and they decided to opt for a more conventional method. Daniel Note clearly felt this to be a stain on his reputation and so asked Isaac Beeckman if he and a number of others would care to see the invention. On 10 May 1620 Daniel Note demonstrated to 17 or 18 'leading enthusiasts in Middelburg', among them Jacob Cats, who had previously busied himself with drainage questions

[...] how the force of a small amount of water on a standing tank is as great as a large amount of water of equal height; which he showed with an oblique weight and standing tanks of leather, all of which is proven and shown generally and accurately by Simon Stevin in his *Waterwicht*.<sup>350</sup>

With this exposition Daniel Note aimed to show that a floating sluice no less than 100 foot long and 20 feet high could be filled with water and sunk to the bottom, where it would remain full until ebb tide and than opened so that

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<sup>347</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. I, pp. 41-45, see, for example, p. 45 'Hetgene hier-vooren geseyt van de waterloopen door buysen, dat komt oock al te passe om den roock, ook hitte ende vier te leyden etc.' See also *ibid.*, vol. I, pp. 74-75, 86-87, 105, 178, and vol. II, pp. 9-10.

<sup>348</sup> Beeckman also refers to Hero of Alexandria.

<sup>349</sup> Note (also known as Nota) had founded a society for his invention a year before: Rijksarchief Zeeland, Register ten Rade Middelburg 1614-1622, p. 100-106 kz – 11 March 1619; and *ibid.*, p. 131, 5 May 1620. The town government doubted whether this costly project would be successful and did not proceed with the invention. Unfortunately, the documents to which the register refers have been lost. A drawing based on these originals is in the Bodel-Nijenhuis collection in the University Library in Leiden, P 34 N 106. See also Sigmond, *Nederlandse zeehavens*, pp. 62-73, esp. ill. on p. 70 and C. van den Heuvel, '“Tot meerder bewijs”. Een kaart en een model van Daniel Note van 1620 ter demonstratie van een nieuwe uitvinding om de haven van Middelburg zandvrij te schuren', *Bronnen van kennis*, Leiden 2005 (forthcoming)

<sup>350</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 39 '[...] hoe dat een weynich water so sterck teghen eenen staenden bodem drangh als een groot water, dat even hooghe was; twelck hij toonde met een scheefwicht alsoock met staende bodemen van leder, twelck alles generaelick ende vastelick van Simon Stevin in syn *Waterwicht* bewesen en betoont is'.



it would scour the whole length of the harbour for a mile in the direction of Rammekens and Arnemuiden. Although Beeckman believed that Melckebeeke ‘had not understood these things, as I know personally that he is not well-acquainted in the true nature of hydraulics’,<sup>351</sup> unlike Daniel Note, he feared that the enormous floatable sluice would be difficult to make and doubted whether its sides would be able to withstand the enormous outward pressure of the water at low tide, especially in a gale. Whether he was right or not, what makes this significant is the role of Stevin’s *Beghinselen des Waterwichts* in providing the scientific basis for a practical solution to this problem.

For a discussion of harbour beds Beeckman would also have been able to consult another work by Stevin exploring topics originally intended for *Huysbou*. In ‘Eertclootschrift’, which Beeckman referred to elsewhere, he would have found an account of the geological aspects of harbour beds, while *Nieuwe Maniere van Sterctebou door Spilsluysen* explained how Stevin tried to use natural processes to keep harbours deep and clean.

In the same year that Beeckman viewed Note’s model for Middelburg harbour he also read Stevin’s *Nieuwe Maniere van Sterctebou door Spilsluysen*.<sup>352</sup> He responded to Stevin’s proposal to divide a harbour with a dyke into two basins that could then be scoured separately by opening the two sluices in turn. Beeckman doubted whether the speed of the water in this divided harbour would be sufficient to scour well enough, and referred explicitly to an earlier comment on the subject. He clearly wished to emphasise that he had arrived at his views with virtually no help from Stevin: ‘I obtained no more knowledge from this book on *Spilsluysen*, since I barely had that in my hand for a quarter of an hour’.<sup>353</sup>

In short, when working on problems in architecture, town planning and hydraulic engineering Beeckman referred to works by Stevin in which these subjects were discussed as marginal issues. While Beeckman certainly had criticisms, he found his own views confirmed in these works. So it is hardly surprising that he later tried to find out more about Stevin’s *Huysbou*. This is reflected in his response to Stevin’s proposal for pipes from lavatories to combat the foul smell. Stevin wanted a straight pipe driven well below the sand that rises with the groundwater whereas Beeckman suggested a pipe that widened as it went down so that ‘the smell, rising up, meets increasing resistance, exactly opposite to the [action of] smoke described elsewhere’.<sup>354</sup> He responded

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<sup>351</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 39. ‘[...] de dynghen niet verstaan heeft, gelyck ick selve ook wel weet, dat hy in de rechte nature van het waterwicht niet seer geoeffent en is’.

<sup>352</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 81.

<sup>353</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 81: ‘Niet meer bescheets en hebbe ick uyt dit boeck van de Spilsluysen, want ick en hebbet maer een vierendeel uers in myn handen gehad’.

in similar fashion to Stevin's experiments with glass spheres to measure the effects of differences in the contraction and expansion of water and ice at different temperatures, explaining the shattering of windows and stones in frost, and Stevin's explanations of fissures in wood and clay.<sup>355</sup>

Beeckman and Stevin wrote in such similar terms on architecture that it is sometimes impossible to determine whether Beeckman inserted excerpts from *Huysbou* into his 'Journal' as his own thoughts or whether he combined his reflections on Stevin's ideas with excerpts from *Huysbou*.<sup>356</sup>

In the years following his first acquaintance with Stevin's manuscripts, Beeckman returned to subjects with which he had long been concerned. He referred only sporadically to Stevin's writings, less as a source of new or supplementary information than for confirmation of ideas he had already proposed before. He tended to cite Stevin in relation to theoretical issues such as the origins of the architectural orders and the rendering of architecture. Although Beeckman and the other members of the Collegium Mechanicum were able to consult *Huysbou* on practical matters, such as ways of allowing smoke to escape, scouring harbours and preparing land for building, it was no longer referred to explicitly.

That Stevin's solutions for the scouring of harbours were widely used is evident from the work of Michiel Floris van Langren.<sup>357</sup> An engineer who worked primarily in the service of Spain, he published a work entitled *Profytenlycken Middel om met Indyckenge van Landt, de Zeehaven van Oostende te Verbeteren* in Brussels in 1650. In it he claimed that the harbours of Dunkirk, Nieuwpoort, Ypres, the canals of Antwerp, the locks of Ghent, Flushing, Middelburg, Den Briel, Delfshaven, Rotterdam and Amsterdam were equipped with scouring sluices. On the orders of Archduchess Isabella he had himself presented a similar solution for Ostend in 1627, but it evidently failed to find favour with Spinola. So Langren had devised a new invention. He did the same for the canal linking the harbour of Mardijk to Dunkirk, which he named Fossa Mariana Regia. He apparently wrote to Huygens about his invention in a letter now lost. Huygens praised Langren's method, but added that he did not believe that the sluices would also prevent silting. This reply from Huygens is interesting

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<sup>354</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 292: '[...] de stanck, opwaerts komende, altyt meer ende meer teghenstandt ontmoete, gelyck int contrarie ergens van den roock geschreue hebben'.

<sup>355</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. II, pp. 292-294.

<sup>356</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 297. De Waard takes the view that these are Beeckman's thoughts on passages he read in the *Huysbou*, see p. 297, n. 1.

<sup>357</sup> See also *The Principal Works of Simon Stevin*, vol. V, p. 74.

because he openly criticised Stevin, whom Langren may also have cited in his proposals for Ostend.

Stevin nous a mis ceste heresie en teste par son traicté Van de spil-sluyzen; mais soyez bien assuré que nous en avons toujours espruvé un effect tout contraire.<sup>358</sup>

Huygens amplified this criticism at the end, referring to a dyke between Haarlem and Amsterdam and the sluices at Willemstad. But while Stevin was not above criticism, it was his contribution to civil engineering that was eventually to receive most attention internationally. Stevin's *Nieuwe Maniere van Sterctebou door Spilsluysen* was translated under the title *Theatrum Machinarum Hydrotechnicarum* by Jacob Leupold in 1724.<sup>359</sup>

Later, in his celebrated standard work *L'Architecture Hydraulique* (1737-1753), Bernard Forest de Belidor noted that modern hydraulic engineering originated in the Low Countries in the second half of the sixteenth century, and praised Stevin as the first to describe the innovations in sluices.<sup>360</sup> According to Brialmont, even Belidor had had little to add to Stevin's texts on hydraulics. Brialmont was probably also the first to offer a verdict on the unfinished *Huysbou*:

C'est une oeuvre plus modeste, mais plus utile. Ce sont des leçons qu'il donne aux gens du peuple pour la construction de bonne maisons, élégantes et commodes. Ainsi, non-seulement il possédait le rare talent de mettre les choses les plus relevées à portée du vulgaire, mais encore le désir d'être utile dominait chez lui toute autre considération dans l'étude des sciences. Ce n'est pas là son moindre titre à la reconnaissance de la posterité.<sup>361</sup>

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<sup>358</sup> Letter from Constantijn Huygens to Michael Florencio de Langren included as a printed appendix of 1660 in the French translation of the latter's *Briefve description de la ville et havre d'Oostende*, [...], (Brussels 1659). See for this discussion also the excellent article on different methods of scouring and inundations at Ostend by P. Lombaerde, in W. Thomas (ed.), 'De herbouw van Oostende na 1604' in *De Val van het Nieuwe Troje. Het beleg van Oostende 1601-1604*, (tentoonstellingscatalogus, Oostende)-Leuven, 2004, pp. 113-125

<sup>359</sup> J. Leupold, *Theatrum Machinarum Hydrotechnicarum: Schauplatz der Wasser Baukunst*, (Leipzig 1724), 'Von Schleussen und Roll-Brucken'. pp. 163-184 and Tables XLIII and XLIV. See A. Brialmont, 'Oeuvres militaires de Simon Stevin', in: M. Steichen, *Mémoire sur la vie et les travaux de Simon Stevin*, (Brussels 1846), p. 134.

<sup>360</sup> B. Forest de Belidor, *Architecture hydraulique ou l'art de conduire, d'élever et de menager les eaux pour les differens besoins de la vie*, (Paris 1737-53).

<sup>361</sup> Brialmont, 'Oeuvres militaires de Simon Stevin', p. 142.

## 7. New writings on architecture

*Regarding architecture in general, which we would wish to see treated, [discussion] is quite rare, while regarding the five architectural orders almost too much has been written.* <sup>362</sup>

While Stevin's views on symmetry and the layout of houses and towns were well developed and occupied an appropriate place in *Huysbou*, the inclusion of technical aspects of building and hydraulic engineering in the treatise remained problematic. Stevin's lack of experience with building practice would explain his reticence to deal with constructional and technical matters in detail; he lacked confidence in the field and seems consistently to have avoided the discussion. In hydraulic and civil engineering, however, he was one of the leading experts of his age. Other considerations must therefore have been responsible for this lacuna in *Huysbou*.

As the analysis of his didactic method shows, Stevin liked to subdivide scientific questions into uncomplex, easily verifiable propositions. One result of this, for example, was that the military aspect of town planning received less prominence. Pragmatic considerations also played a role. Stevin wrote prodigiously about water, including descriptions of civil engineering inventions and hydraulic engineering commissions. Several of these innovations and solutions were connected to and sometimes arose from defence technology. It is hardly surprising, therefore, that Stevin placed texts which may not have had an obvious place in *Huysbou* in other publications. This in turn influenced his reputation as a writer on architecture, for while scholars who owned copies of *Huysbou*, or were familiar with the excerpts published by his son in *Materiae Politicae* knew of Stevin's views on architectural theory, readers of *Nieuwe Maniere van Sterctebou door Spilshuysen* would hardly have suspected that parts of that work were originally intended for a comprehensive treatise on architecture. As a result, these sections began to take on a life of their own, as Leupold's copy of Stevin's treatise on sluices demonstrates. This tendency became even more pronounced when Dutch architectural theory fragmented into several specialised areas in the seventeenth and eighteenth centuries.

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<sup>362</sup> W. Goeree, *D'Algemeene Bouwkunde*, Volgens d'Antyke en Hedendaagse Manier, (Amsterdam 1681), p. 130: 'Van den algemeenen Huisbouw, zoo als wy die geeren verhandeld zagen is vry spaarzaam, maar van de vijf Bouw-ordens alree by na te veel geschreven'.

Despite this specialisation, attempts continued to be made to combine discussions of the classical orders with other themes that ancient and Italian Renaissance scholars had regarded appropriate to architecture. In 1614, for example, Samuel Marolois published his *Opera Mathematica ou Oeuvres Mathématique, Traictans de Géométrie, Perspective, Architecture et Fortification* in The Hague. He did not treat these disciplines as an integrated whole, however. Indeed, in the Dutch version the different sections of the book soon became separated. Thus in 1628 Marolois's discussion of fortification appeared in an adaptation by Hendrik Hondius as *Fortificatie, dat is Sterctebouwing*, followed ten years later by *Architectura, dat is Bouwkunst*. The former covered important innovations in fortification, but the latter still leaned heavily on Vredeman de Vries's discussion of architectural orders. In his *Architectura Moderna* of 1631 Salomon de Bray presented Hendrick de Keyser as the first proponent of true architecture, while Philip Vingboons offered illustrations of his own 'most notable' buildings in two volumes.<sup>363</sup> The short introductions to these works differed from the treatises on ancient and Italian Renaissance theory in their emphasis on the biblical origins of architecture, but this hardly amounts to a distinctly Dutch theory of architecture.<sup>364</sup> Despite their incompleteness, the *Huysbou* excerpts published in 1649 in *Materiae Politicae* can fairly be described as the first printed theoretical work on architecture in the Dutch language not only to be concerned with the situation in the Low Countries but also to present various elements of architecture and town planning in a coherent fashion. However, this did not herald a change of direction. The same year saw the publication of a more or less complete edition of Vitruvius, although in Latin, and the architectural publications of the day were largely confined to reissues of Scamozzi and Vignola on the classical orders.<sup>365</sup>

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<sup>363</sup> S. de Bray, *Architectura Moderna ofte Bouwinge van onsen tyt*, (Amsterdam 1631; reprint: Soest 1971) with an introduction by E.R.M. Taverne, 'Salomon de Bray's "Architectura Moderna": Biography and Manifesto'. 'Afbeeldsels der voornaemste gebouwen uyt alle die Philips Vingboons geordineert heeft' (Amsterdam 1648) and 'Tweede Deel vande Afbeeldsels der voornaemste gebouwen uyt alle die Philips Vingboons geordineert heeft' (Amsterdam 1674) are both included in their entirety in K. Ottenheim, *Philips Vingboons (1607-1678): Architect*, (Zutphen 1989).

<sup>364</sup> E.R.M. Taverne, 'Salomon de Bray's "Architectura Moderna": Biography and Manifesto', introduction to: De Bray, *Architectura Moderna*. In his study 'Stevens koopmanstad' Taverne pointed out the importance Stevin attached to the biblical origin of his town plan and linked this to Salomon de Bray's *Architectura Moderna*. While biblical origins did indeed have an important role in Stevin's works on military camps, there are hardly any biblical references in the known excerpts from the *Huysbou*.

<sup>365</sup> K.A. Ottenheim, 'De Vitruviusuitgave van Johannes De Laet (1649)', in *Bulletin Koninklijke Nederlandse Oudbeidskundige Bond*, (1998), no. 2, pp. 69-76 and A. Hopkins/A. Witte, 'Van luxe architectuurtractaat tot praktische handleiding: de Nederlandse uitgaven van Scamozzi's *L'Idée della Architettura Universale*', in *Bulletin Koninklijke Nederlandse Oudbeidskundige Bond*, (1997), no. 5, pp. 137-153.

Nonetheless, in the second half of the seventeenth century some attempts were made to supplement these classical digests with a general discussion of architecture; and some authors seem to have made use of the printed excerpts from *Huysbou*. Willem Goeree's *D'Algemeene Bouwkunde* of 1681 is the first clear example.<sup>366</sup> While opening with a review of the development of the various orders, in the second part Goeree dealt with 'algemeene Huysbouw' ('house building in general'). Here he discussed the qualities required of an architect, such as familiarity with design, costing and other skills, he described the facilities and rooms, including the *lichtplaatsen* (courtyards), of a house, as well as those of principal public buildings, country houses and hydraulic works.<sup>367</sup> Stevin's influence is particularly evident in Goeree's detailed description of the house. While he did not adopt Stevin's mirror-symmetrical layout of the house because he believed in the proportional symmetry of one original, divine order, Goeree did follow Stevin on direct lighting of all rooms and the need to keep out intrusive neighbours. Goeree's remarks on internal routing and chimney systems can also be traced back to Stevin. The solution offered by Goeree for the poor lighting of intervening rooms in houses built on the typical long narrow plots of Dutch towns had already been discussed and depicted by Stevin. Goeree's particular interest in the uses made of the house by the man and woman occupying it and by their children, servants and guests is apparent from his observations on the layout, a concern reflected in Stevin's detailed ground plan and accompanying comments.<sup>368</sup> The similarities between Stevin's *Huysbou* and Goeree's discussions of civic architecture are also apparent in the topics they covered: rooms, galleries, wardrobes, kitchens, pantries, various chimneys, smoke dispersal, cellars, cisterns, wells, the well at Amster-

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<sup>366</sup> For a more detailed discussion of Goeree and the theme of the 'algemeenen huysbouw' in seventeenth-century architecture theory in the Low Countries, see Van den Heuvel, 'Willem Goeree' and H. de Mare, *Het huis en de regels van het denken*, (Amsterdam 2003)

<sup>367</sup> When discussing the rooms Goeree notes that mistakes are often made in 'schikken, zoeken en ordineeren van lichten' (arranging, finding and ordering lights) and that people had only a poor understanding 'van middelplaatsen in de woonhuizen' (of central areas in dwellings). Goeree, *D'Algemeene Bouwkunde*, pp. 134-135.

<sup>368</sup> See chapter 2 and cf. De Mare, 'A rule worth following'. It should be noted that in Stevin it is the symmetrical form that dictates the separation of husband and wife and not the other way round, whereas in Goeree form and lay-out tend to follow use. Furthermore, the works of Stevin and Goeree cannot be seen simply as general confirmations of 'gender classifications' in Dutch architecture theory. As Goeree himself pointed out, discussion of civil architecture was the exception rather than the rule; moreover, he seems to have used Stevin's work as a model, so these are far from being two independent testimonies to a general seventeenth-century phenomenon.

dam's Oudemanshuis, quicksand and the cleanliness of the Dutch. Goeree's comparison of the *grote saal* (main hall) with a market in a town is also found in Stevin, who even used the same terms. Amid these topics Goeree included passages that do not relate directly to known texts by Simon Stevin. These may have been borrowed from lost fragments of *Huysbou*, although Goeree also referred here to other authors who lived after Stevin's time. Probably he based his discussion of civic architecture on excerpts and lists of contents published in *Materiae Politicae*, rearranging and supplementing these as he thought fit.<sup>369</sup>

Another work largely compiled in the Low Countries in the second half of the seventeenth century was also designed to provide a comprehensive treatise on architecture. This was the treatise completed in 1665 by Nicolaus Goldmann shortly before his death. In it he discussed the obligatory orders but also houses and public buildings and facilities such as churches, schools, hospitals, waterworks, mills and many other subjects. He gave it the title *Der Vorläuffer der Bau-kunst*. Although negotiations for publication were well advanced by the time he died, Goldmann did not live to see his *magnum opus* in print. It eventually appeared in 1696, when it was published in revised form by the celebrated architectural theorist Leonard Christoph Sturm under the title *Vollständige Anweisung zu der Civil-Baukunst*.<sup>370</sup>

Goldmann wrote the book almost entirely in Leiden where, except for a brief interval, he worked as a lecturer on mathematics and architecture from 1629 until his death. While less obviously than Goeree, Goldmann also seems to some extent to have taken his cue from Stevin's architectural texts. Not that their opinions coincided – they had fundamentally different views on symmetry, for example – but rather that their scientific approach was similar, as was the way they presented their ideas. Both works were used for teaching and both laid the same emphasis on the transmission of knowledge. Like Stevin, Goldmann began with a firm theoretical and hierarchically organised foundation; he also opened with some introductory definitions. Stevin was a supporter of the use of dichotomies and probably intended to present *Huysbou* in this way; Goldmann put the arrangement into dichotomies into practice when presenting the issues to be considered in the treatise. He even presented the divine disposition of the Temple of Solomon as a dichotomy.<sup>371</sup>

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<sup>369</sup> Thus in the passage about refurbishing houses Goeree refers to Vingboons and in the discussion of locks and keys, which Stevin had also covered, to a publication by Marturin Brisse de la Fleche.

<sup>370</sup> The information about this treatise is taken from the excellent article by J. Goudeau, 'Nicolaus Goldmann (1611-1665) en de praktijk van de studeerkamer', in *Bulletin van de Koninklijke Nederlandse Oudheidkundige Bond*, (1995/6), pp. 185-203.

<sup>371</sup> On a sketch by Goldmann of the Temple of Solomon, we read in his hand: 'Tota dispositio per quadruplicem dichotomiam'. See J. Goudeau, *Nicolaus Goldmann (1611-1665) Architectuurtheorie in een wiskundige wereld*, (Utrecht University PhD) [typescript] 2005, ill. 9.10.

Ramist theory was widely accepted in Germany, where Goldmann's work appeared, and it was not unusual to present science in terms of dichotomies. Like Goldmann, other architectural theorists in German-speaking areas also opened their *Zivilbaukunsten* with intricate tables of dichotomies. This approach to architecture cannot therefore be traced directly to Stevin, particularly since these general treatises soon gave way to specialised discussions on particular types of buildings.<sup>372</sup>

Nonetheless, the German principalities clearly provided fertile scientific and cultural ground for the ideas about architecture then developing in the Dutch Republic. Many mathematicians and engineers from German-speaking areas studied at universities in the Low Countries, at Duytsche Mathematique or under private tutors, while several Dutch architects received commissions from German rulers. Although no evidence is found in the sources to support the claim, Goldmann is supposed to have been one of the favourite scholars of the Elector of Brandenburg, Frederick William, while his stadholder in Cleves, John Maurice of Siegen, had personally copied out Goldmann's treatise on architecture.<sup>373</sup> It is not surprising then that Goldmann turned to them for the publication of his work and that it first appeared in print, by a roundabout route, in the German language.

In addition to similarities in the scope of their work, Goldmann's familiarity with Stevin's views on architecture is also apparent from a more concrete source: the sale catalogue of the author's library lists *Materiae Politicae* among the works on architecture.<sup>374</sup> Goldmann's ideas about architecture were known to some extent among German theorists, primarily through Leonard Christoph Sturm's publications but also through various manuscripts. It was in this way that he helped foster the scientific approach to civil architecture which dominated the various *Zivilbaukunsten* that appeared in Germany. In the Low Countries, the main foundation for this theoretical development had been laid by Simon Stevin. The extent to which these authors were acquainted – via

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<sup>372</sup> The leading figures in German architecture theory before and after Goldmann's publication, such as Joseph Furtenbach d. Ä. and even Leonard Christoph Sturm, not only presented military and civil architecture in separate works in the usual way, but also devoted separate theoretical texts to different types of buildings, such as public edifices, churches, dwellings and country houses. On this see U. Schütte e.a. (ed.), *Architekt und Ingenieur: Baumeister in Krieg und Frieden*, (Wolfenbüttel 1984). In particular the chapter by Ulrich Schütte, 'Die Lehre von den Gebäudetypen', pp. 155-260. See also H.W. Krufft, *Geschichte der Architekturtheorie von der Antike bis zur Gegenwart*, (Munich 1985), chapter 15.

<sup>373</sup> Goudeau, 'Nicolaus Goldmann', p. 186.

<sup>374</sup> *Ibid.*, p. 202, n. 14. Catalogus variorum et insignium librorum praecipue mathematicorum, Nicolai Goldmanni, mathematici, qui publica auctione distrahentur in aedibus Thomae Hoorn, Bibliop. Catalogue in the University Library of Warsaw, Mf. 5096-Wrocaw BU 542575/4nA56,15: *Materiae Politicae* is listed under the works on architecture. Information kindly provided by Jeroen Goudeau.



Goldmann or otherwise – with Stevin’s views on related topics in civil architecture as recorded in *Materiae Politicae* is difficult to tell.

While several eminent figures in the arts and sciences in the Dutch Republic appear to have been familiar with Stevin’s ideas about architecture, *Huysbou* did not enjoy a wide reputation as an architectural treatise. Isaac Beeckman, Hendrick Stevin, Constantijn and Christiaan Huygens and probably Pieter Post saw actual excerpts; others probably only knew that Stevin had planned a comprehensive treatise through *Wisconstighe Gbedachtenissen* and later *Materiae Politicae* and *Wisconstich Filosofisch Bedryf*. Nevertheless, besides these scholars and artists, Goeree and Goldmann also recognised the value of Stevin’s work, even though they may only have been acquainted with *Huysbou* from the extracts published by his son. Stevin’s eclectic approach to a wide range of aesthetic and architectural themes clearly influenced Goeree’s work, while it seems to have been the lucid presentation of architecture as a scientific and didactic problem which most appealed to Goldmann. However, the attempt by Stevin, and by Goeree and Goldmann after him, to produce a comprehensive work on architecture remained the exception rather than the rule in the seventeenth-century Low Countries.

While he caught the imagination of scholars like Isaac Beeckman and possibly Christiaan Huygens and Claude Perrault, Stevin’s ideas on aesthetics met with almost no response among seventeenth-century Dutch writers on architecture. Even those who ventured past a standard presentation of classical orders refused to give up conventional proportional symmetry in favour of Stevin’s innovative mirror symmetry. Some of his other ideas, originally intended for *Huysbou*, gained currency through works on completely different subjects. The history both of *Huysbou* and its reception is therefore largely one of fragments.

While Stevin responded to the aesthetic ideas presented in works on the classical orders, he also extended architectural theory to take in practical aspects of house building and town planning, hydraulic engineering and fortification in the Low Countries. It is therefore impossible to determine the true impact of *Huysbou* without a thorough examination of the various traditions in architectural theory – the knowledge of architecture disseminated in printed treatises on the classical orders as well as the knowledge contained in more detailed but little known manuscripts on architecture and in theoretical discourses on allied subjects such as fortification and hydraulic engineering. This requires research into the survival of the traditions of classical and Italian architecture theory and into the foundations of new Dutch architectural theory. It is a study, in other words, that focuses not only on marble columns but also on wooden piles.

# Reconstructing Stevin's Huysbou: a hypothesis



## 8. The history of Huysbou

[...] the manuscripts which have now, through neglect, been entrusted these many years to various learned hands.<sup>375</sup>

### *Simon Stevin's unfinished works*

The reason why they are not presented in accordance with the contents of the above summaries is because they were not ready when the printer no longer wished to keep [the printed parts], which had been lying at the back, printed, for some time, so that it is now my intention to publish the rest at some other time.<sup>376</sup>

With these words Simon Stevin explained why a number of texts listed in the contents of *Wisconstighe Gbedachtenissen* were missing when the work finally came out in two volumes, published in 1605 and 1608. The 'Vijfde Stuck der Wisconstighe Gbedachtenissen: Vande Ghemengde Stoffen' was to have included not only the two parts 'Vande Telconstighe Anteyckeningen' and 'Vande Vorstelicke Bouckhouding in Domeine en Finance Extraordinaire' but also four other parts entitled 'Vande Spiegheling der Singconst', 'Vanden Huysbou', 'Vanden Crijchshandel' and 'Van verscheyden Anteyckeningen'.

Stevin never managed to publish these texts. When he died in The Hague in the spring of 1620, he left his widow a collection of unfinished manuscripts. Among them were many texts by him that did not survive, as well as some excerpts from other scholars and additions to works already published. When he visited Stevin's widow in Hazerswoude in 1624, Isaac Beekman sorted through

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<sup>375</sup> H. Stevin, 'Vant geen den Schryver bewogen heeft in leec bedrijf naer wijsheyt om te sien', in *Wisconstich Filosofisch Bedryf van Hendrik Stevin*, (Leiden 1667), p. 5: '[...] de handschriften welke nu deur onachtsaemehey, al veel jaren onder verscheyden geleerde handen waren vertrouwt'.

<sup>376</sup> S. Stevin, *Wisconstighe Gbedachtenissen*, 'Vijfde Stuk der Wisconstighe Gedachtenissen: Van Etteliche ghebrenkende stoffen, die inde voorgaende Cortbegrippen wel ghestelt wesende, nochtans daer na onbeschreven sijn ghebleven', p. 107: 'D'Oirsaeck waerom die niet ghestelt en sijn na t' inhoudt der voorschreven Cortbegrippen, is datse niet volcommelick genouch gereet en waren, doen den Drucker niet langer by hem begheerde te bewaren datter een tijt lanck tot sijn achterdeel ghedruckt hadde ghelegghen: Sulckx dat mijn voornemen nu is de bovescreven rest ter ghelegghnder tijt te laten uytgaen'.

these papers and drew up a list of titles. He also made copies of what were to him the most interesting passages and included them in his 'Journael'.<sup>377</sup>

Some of the titles in Beeckman's list – 'Vande singconst', 'Cryghconst seer veel daervan' and 'Huysbou' – clearly refer to the works Stevin listed in the contents of *Wisconstighe Ghedachtenissen*. Although these texts were evidently not ready to appear in print in 1608, they presumably consisted of more than a few unconnected notes. At that point they probably already formed a collection of complete and almost completed chapters. The title 'Vijfde deel der ghemeyngde stoffen: Van de Chrychsconst', which Beeckman noted beside one excerpt, reveals how easily the original structure of *Wisconstighe Ghedachtenissen* could be recognised in the manuscripts Stevin left.<sup>378</sup>

Stevin nonetheless continued adding new texts until his death and this must have led to the idea of publishing this material as a separate work rather than in *Wisconstighe Ghedachtenissen*.

Obviously the unfinished section titled 'Van verscheyden Anteyckeningen' did not lend itself to this treatment, but there are clear indications that Stevin intended to develop the chapters of the 'Vijfde Stuck der Wisconstighe Ghedachtenissen: Vande Ghemengde Stoffen' entitled 'Vande Spiegheling der Singconst', 'Vanden Huysbou' and 'Vanden Crijchshandel' into separate treatises.

Not a word of Stevin's treatise on music was printed until 1884. In that year D. Bierens de Haan found a manuscript entitled *Spiegheling der Singconst* in a collection of miscellanea by Constantijn Huygens and published it.<sup>379</sup> Besides Stevin's manuscript, Bierens de Haan also published an anonymous but closely related work entitled 'Sing-Const van Stevin' and a commentary by the organist Abraham Verheyen addressed to Stevin. Verheyen questioned Stevin's mathematical division of notes and Isaac Beeckman was also later to reject his proportional division of the octave. According to Fokker, in his edition of the text in *The Principal Works of Simon Stevin*, criticism by contemporaries may explain why Stevin never published his *Spiegeling der Singconst*.<sup>380</sup>

Simon Stevin did publish parts of his planned treatise on military matters as separate works under the titles *Nieuwe Maniere van Sterctebou door Spilshuysen*

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<sup>377</sup> See Appendices F and A, respectively.

<sup>378</sup> Isaac Beeckman, 'Journael', vol. II fol. 209v-224v: 'Chrychshandelinge van Stevyn in 161/2 blaeren gecompandiert'. See also the title of the copy by Hendrick Stevin in The Hague, KB 128-A-10: 'Vijfde deel der gemengder stoffen'.

<sup>379</sup> Bierens de Haan, '*Vande Spiegeling der Singconst*'

<sup>380</sup> A. Fokker reaches this persuasive conclusion in his reissue of the work in the series: E. Crone, E.J. Dijksterhuis, R.J. Forbes, M.G.J. Minnaert and A. Pannekoek (eds), *The Principal Works of Simon Stevin*, (Amsterdam 1955-1966), vol. V, pp. 415-464, p. 416. A fully annotated new edition of *Singconst* is being prepared by Rudolf Rasch (University of Utrecht).

and *Castrametatio, Dat is Legermeting*, both in 1617.<sup>381</sup> But he never abandoned the idea of a comprehensive treatise on this subject. In the dedication to the States General of his *Nieuwe Maniere van Sterctebou door Spilshuysen* he observed almost apologetically:

It is true that some people have counselled me to treat it as part of the problem of fortification expecting a fuller description of it, but I preferred first to extract this part so that it might not be included among many other matters which do not interest everybody, and thus might be read better by many and especially by those who have proper judgement to apply it in practice.<sup>382</sup>

The inventory of Stevin's manuscripts drawn up by Isaac Beeckman includes many texts on various military matters which were probably intended for his treatise *Vande Crychsconst*. Beeckman's list of the contents of a manuscript of this title contained two books: 'Vanden Chrychsconst Te Lande' and 'Vanden Chrychsconst Te Water', all trace of which had already been lost in the seventeenth century.<sup>383</sup> The titles in the list of contents, with eleven 'onderscheytsels' and an 'aenhanck van geschillen', do not correspond with those in Beeckman's inventory of Stevin's manuscripts, although many cover the same subjects. This suggests that Stevin had decided to put the texts originally intended for 'Vijfde Stuck der Wisconstighe Ghedachtenissen: Ghemengde Stoffen Vanden Chrychshandel' together with *Vande Chrychsconst*, to which new notes had continually been added, in a comprehensive treatise with the

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<sup>381</sup> The works are published in *The Principal Works of Simon Stevin*, vol. iv, pp. 233-245 and 247-379 and vol. v, pp. 83-199.

<sup>382</sup> Dedication in *Nieuwe Maniere van Sterctebou door Spilshuysen*, [Rotterdam 1617], published in *The Principal Works of Simon Stevin*, vol. v, pp. 87-89: 'Tis wel zoo, dat eenighe die my vermaent hebben, de zake van Sterctebou te laten uytgaen, daer af een volkomender beschrijving verwachten: Maer my heeft goet ghedocht voor eerst dit ghedeelte daer uyt te trecken, op dattet niet staende onder veel ander stoffen die niet yghelic gading en zijn, te beter van velen mocht ghelesen worden, en voornaemlick van zulcke diens oordeel totte zake ghelt, om het dadelic ghebruyck daer uyt te doen volghen'.

<sup>383</sup> Isaac Beeckman, 'Journal', II, fol. 209v: 'Cortbegryp deser Crychconst'. See De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 420, appendix G. 'Van den Cryghconst'. The 'Crychconst te lande' part also included a 'Vande Sterctebou'. Of this Hendrick Stevin wrote 'Den autheur heeft een ander manier van sterctebou beschreven dan degene, die hij overlang heeft uytgegeven' (The author has given a different description of fortification than that which he published long ago). The contents of this work, differing from both *Sterctebouwing* of 1594 and *Nieuwe Maniere van Sterctebou door Spilshuysen* of 1617, both known to Hendrick Stevin, may correspond to a French text in a manuscript in the Bibliothèque Nationale in Paris, M. Fr. -24264, fol. 72-74: 'Ensuite une courte & simple instruction de l'art de fortification selon l'ordre de Stevin, Mathematicien de Son Excellence Prince de Nassau, general de l'armee'. In the table of contents ('Tytels en Cortbegrypen') at the end of his *Materiae Politicae*, (fol. 139), Hendrick Stevin states: 'De watercrych en is niet gevonden'. See further Van den Heuvel, "Simon Stevin, 'De Crychconst/Le traité incomplet'.

same title, *Chrychsconst*.<sup>384</sup> Further evidence for this is provided by Beeckman's note on the copy of 'Vyfde deel der ghemeynghde stoffen: Van de Chrychsconst, Chrychshandelinge van Stevyn in 16 1/2 bladen gecompentieert'.

Stevin's son Hendrick made copies of a number of these texts which are now at the Royal Library in The Hague; he published others in *Materiae Politicae*, which appeared in Leiden in 1649.<sup>385</sup> Hendrick Stevin compiled a detailed, complex table of contents in which the chapter on 'Chrychsspiegheeling' alone contained seventeen subsections. This reconstruction of *Chrychsconst* as it was originally intended was made yet more complicated by the fact that in his copies the author's son added excerpts from other works, such as *Huysbou*. Historians such as Alex Brialmont, Cornelis de Waard, Eduard Dijksterhuis and Willem Hendrik Schukking have tried to impose some order on Stevin's extensive military oeuvre.<sup>386</sup> As the editor of the fourth volume of *The Principal Works of Simon Stevin*, on the art of war, Schukking made a thorough analysis of Hendrick Stevin's transcripts of texts dealing with military matters and of related manuscripts which several authors attributed to Simon Stevin. Such analyses also prove valuable, however, in the reconstruction of the history and structure of *Huysbou*. *Huysbou* was intended to form part of *Wisconstighe Gbedachtenissen* together with 'Vande Chryschshandel', and indeed excerpts from the treatise on architecture found their way into copies of texts dealing with military matters.<sup>387</sup>

Finally, another important group of manuscripts left by Stevin are those on hydraulic engineering. He had already discussed this subject at length in 'Eertclootschrift' and *Nieuwe Maniere van Sterctebou door Spilsluysen*.<sup>388</sup> His son put the remaining texts together in a separate work entitled 'Waterschuyring' in *Wisconstich Filosofisch Bedryf* in 1667. It is doubtful, however, whether this was

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<sup>384</sup> The words 'seer veel daarvan' (a great deal of this) added after *Chrychsconst* is a further indication that the work had already reached quite an advanced stage. On this work see also C. van den Heuvel, 'De Huysbou en de Crychconst van Simon Stevin: Nieuwe theorieën van de Hollandse stad en van haar verdediging', in *De zeventiende eeuw*, vol. 10, (1994), no. 1, pp. 79-92.

<sup>385</sup> KB 128-A-9, KB 128-A-9-II and KB 128-A-10. For a discussion of these and various other related manuscripts see W.H. Schukking (ed.), 'The Art of War', in *The Principal Works of Simon Stevin*, vol. IV, (Amsterdam 1964); see also Van den Heuvel, 'Simon Stevin, De Crychconst en de Duytsche Mathematique *De geboorte van de nieuwe wetenschap. Simon Stevin (1548-1620)*', Brussel 2004, pp. 105-109.

<sup>386</sup> A. Brialmont, 'Oeuvres militaires de Simon Stevin' in M. Steichen, *Mémoire sur la vie et les travaux de Simon Stevin*, (Brussels 1846); De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 420 ff; Dijksterhuis, Simon Stevin, W.H. Schukking (ed.), *The Principal Works of Simon Stevin*, vol. IV (Amsterdam 1964), esp. pp. 8-16.

<sup>387</sup> See Appendix B, p. 457.

<sup>388</sup> 'Eertclootschrift' forms the second chapter of the first part of *Wisconstighe Gbedachtenissen* entitled 'Vant Weereltschrift'.

what Stevin had intended; significant evidence exists to suggest that some passages were actually meant for *Huysbou*.

Besides Isaac Beeckman and Hendrick Stevin, other scholars were also familiar with the contents of *Huysbou*. The following chronological review charts works published in Simon Stevin's lifetime and later in which the manuscript or passages from it are mentioned.

*The first Huysbou and Wisconstighe Gedachtenissen 1605-1608*

Stevin first mentioned *Huysbou* in 1605 in the third part of *Wisconstighe Gedachtenissen* – 'Van de Deursichtige' He described how he had earlier examined the question of correct perspective drawing in a 'Huysbau' that he had written a few years before.<sup>389</sup> While he may have been referring to the treatise on architecture which he planned to include in *Wisconstighe Gedachtenissen*, there is reason to suggest that this was a separate manuscript. Not only did Stevin state that he had written the work for his own use, but the discussion of perspective is not found in any of the various lists of contents of the unfinished *Huysbou*.<sup>390</sup> This manuscript may have contained an essay on the classical orders discussed by Vitruvius, Alberti and Serlio. One indication for this is the listing of a discussion by Stevin of the measurements of columns and their ornaments based on these authors.<sup>391</sup> Stevin eventually omitted this discussion because he no longer regarded it as important, although he remarked that he had in the past devoted considerable time to the subject. It is possible that he had done so while working on this early treatise on architecture and that the passages from 'Aenteijckeningen op Serlijns en anderen' which were added to Stevin's texts by his son in the form of *geschillen* (discussions) were in part derived from it.

As to the date of this first 'Huysbau', the only clue is Stevin's mention of the discussion of perspective drawing of architecture in the second chapter of Vitruvius' first book, distinguishing between depictions of architecture in ground plans, elevations and perspectives. This is significant in that Stevin

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<sup>389</sup> D.J. Struik (ed.), *The Principal Works of Simon Stevin*, vol. II b, p. 800: 'Nu alsoo ick over eenighe jaren, voor my self beschreven had een Huysbau, tot welcx oeffening den Boumeester, na t' gheemeen ghevoelen van velen, en t' besonder gevoelen van Vitruvius int 2 hoofdstick sijns 1 boucx, kennis der verschaeuwing voorderlick is, soo heb ick breeder dan daer te vooren deursien en ondersocht verscheden Schrijvers van dese stof handelende, en na mijn stijl van dies een beschrijving ghemaeckt'.

<sup>390</sup> In most Renaissance treatises perspective drawing of architecture is dealt with in the first chapter. Stevin adds that Vitruvius discusses this in the second chapter of his first book.

<sup>391</sup> S. Stevin, *Huysbou*, 'Aenteijckeningen op Serlijns en anderen/Inhoudende sommige geschillen', cf. H. Stevin, 'Byvough', p. 110: 'Maten der pilaren met haer aencleving'.



used the same sequence in his depictions of military architecture in his treatise on fortifications, *Sterctenbouwing*, of 1594. Given that in this work he did not refer to his treatise on architecture, which covered the same ground, it would seem that this first ‘Huysbau’ must date from after 1594.

Stevin again referred to a treatise on architecture in the first part of *Wisconstighe Ghedachtenissen* entitled ‘Vant Wereltschrift’ (Cosmography). In the introduction to the chapter on geography, ‘Eertclootschrift’ he explained that he had made a thorough study of the erosion of building structures, settlement, the silting up of canals and the difficulties encountered in driving piles, and had recorded his observations in a treatise on architecture.<sup>392</sup> After Maurice had read this *Huysbou* and pointed out to Stevin how valuable it was, he decided to publish passages from it:

So I presented the same in his *Wisconstighe Gedachtenissen*: although I did not add it to *Huysbou*, but in the common ‘Eertclootschrift’, being massive forces which are not the result of human endeavour [...] the general rules that can be deduced from which apply to more than [just] architecture.<sup>393</sup>

The passage in question clearly reflects the characteristic features of Dutch geography and suggest that from the beginning Stevin’s *Huysbou* was fundamentally different from other works on architecture then current and that it devoted considerable attention to civil engineering.

In short, therefore, the history of *Huysbou* probably began with two different manuscripts. Stevin had begun work on one for his own use a considerable time before the publication of *Wisconstighe Ghedachtenissen*, but probably after 1594, and presumably put this to one side. The other was originally intended to

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<sup>392</sup> S. Stevin, *Wisconstighe Ghedachtenissen*, ‘Tweede Bouck des Eertclootschrift Vant Stofroersel des Eertcloots’, ‘Oirsaeck der beschrijving deses 2 boucx’, p. 51: ‘Nadien Sijn Vorstelicke Ghenade ghesien hadde de Bouconstens vermaerde afcomst des Huysbou, endaerbenevens hem inde Sterctebou dadelick seer geoeffent: Soo heeft hij ghesien wat swaricheden daer in te vooren comen, van wercken die deur qua gront insincken en omvallen: En daer stroom teghen comt, hoese met hooghe wateren af spoelen, de grachten versanden, en verslemmen. Tot ettelicke plaetsen condemen inde grachten gheen behoitlicke diepeten krijghen, om de opwelling vant sandt: De heypalen en conden oock dickwils int welsandt tot gheen begheerde diepte gheraken. Sach voort dat sommige havens versanden, of met slijck vervulden, welcke men meenende te verbeteren, na groote cost somwijlen vererghert waren, en dat en raedt van d’een en d’ander teghen de bovenscreven onghewallen, dickwils seer verscheyden viel, sonder oopenighe gemeene eker gront gelet te worden, streckende benefens verloren costen tot onsekerheys des landts’.

<sup>393</sup> *Ibid.*: ‘Soo hebbe ick ’t selve onder sijn Wisconstighe gedachtenissen gestelt: Doch niet by den Huysbou vervought, maer by t’ gemeen Eertclootschrift, als wesende groote roersels die niet deur menschen macht en geschien [...] waer af de ghemeene reghelen dieder uytgetrocken worden verder dan totten Huysbou strecken’.

be included in his collection of mathematical works, but despite modifications and additions was never completed.

#### *Isaac Beeckman's 'Journael' (1602-1634) - 1624*

When Isaac Beeckman compiled a list of Simon Stevin's manuscripts at Hazerswoude on 15 June 1624, he took the opportunity to copy out part of *Huysbou*. Beeckman included this in his 'Journael', which for 30 years he worked up from daily notes of experimental observations and comments on the work of other scholars. He also had summaries made by an unknown copyist.<sup>394</sup> The transcript is headed 'Huysbou van Stevyn gecompndieert in 9 blaren' ('Stevin's Huysbou in a 9 page compendium').<sup>395</sup> When he left, Beeckman was able to take some of Stevin's manuscripts with him; these were the papers relating to 'Singconst', the subject that probably interested him most. But Beeckman soon returned to go through Stevin's treatise on architecture, for in the middle of his excerpts he noted that he had seen Stevin's 'Bouwkonst' on 26 June 1624.<sup>396</sup> After again taking notes from part of 'Spiegheling der Singconst' on 29 June, Beeckman added a final series of notes from *Huysbou*.<sup>397</sup> The latter concluded with the earliest known list of contents of Stevin's treatise on architecture.<sup>398</sup> Beeckman did not confine himself to excerpts and a list of contents of *Huysbou*, but added his own commentary as well. In formulating his own thoughts on architecture, he occasionally reacted to Simon Stevin's texts, remarks that form a valuable aid in reconstructing the contents of *Huysbou*.

#### *Collegium Mechanicum 28 August 1626 – Spring 1627*

Isaac Beeckman founded Collegium Mechanicum in Rotterdam to enable scholars and those skilled in various crafts and trades to meet and discuss problems in applied science and practical mechanics.<sup>399</sup> Starting in the summer

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<sup>394</sup> The short remarks on 'Huysbouw' on fol. 194r and v and 195v are in Beeckman's hand. The same applies to the extracts from the works of Simon Stevin of 196v-224v, such as *Crychconst*, *Cammen Staven*, *Watermolens en de Cleytrecking* and 'Waterschuyring'. The extracts from *Huysbou* and *Singconst* fol. 225r-233v are in the hand of the copyist.

<sup>395</sup> See, Appendix A, p. 437.

<sup>396</sup> See, Appendix A, p. 440.

<sup>397</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 398 identifies a third series of notes from 229v l. 16. They have no special title, however, and give no indication as to the date of a possible new visit.

<sup>398</sup> See Appendix G.

<sup>399</sup> Van Berkel, 'Het Collegium Mechanicum', pp. 336-341.

of 1626, they met every fortnight. Minutes of the discussions were taken and Beekman made notes in his 'Journael'.<sup>400</sup> These contain no literal quotations from *Huysbou*, but the topics raised at Collegium Mechanicum, such as smoke dispersal, watermills and the foundations of houses, suggest that the members regularly consulted excerpts from Stevin's treatise. Collegium was dissolved by the time Beekman departed for Dordrecht to become headmaster of the Latin School, in May 1627.

*Stevin's 'Vande Molens Gereviceerd Door Den Professor Golius' 1634*

In 1634 the well-known expert on oriental manuscripts and professor of mathematics at Leiden University, Jacob Golius, edited part of Stevin's treatise on mills.<sup>401</sup> This is significant in that part of his 'Weechdadelichen Handel Van Cammen En Staven in Watermolens' and 'Cleytreckingmolens' was listed in conjunction with the treatise on architecture in *Materiae Politicae*.<sup>402</sup> Although Stevin had indeed intended to deal with mills for regulating water in *Huysbou*, the text edited by Golius was probably meant as a separate work. The edited version was acquired by Huygens and discovered by Bierens de Haan, who published it in 1884 along with Stevin's 'Vande spiegeling der singconst'.<sup>403</sup>

*Hendrick Stevin's Reply of 1 February 1636 to a Request from Constantijn Huygens (?) for a copy of Huysbou*

On 27 January 1636 Hendrick Stevin received a request, since lost, for permission to view the 'Huysbau' manuscript. This is evident from his reply of 1 February of that year, now at Bruges City Archive (see ill. 19 on page 126).<sup>404</sup> The

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<sup>400</sup> The minutes were copied in the same hand as the excerpts from Stevin's texts.

<sup>401</sup> On Golius, ad vocem in several publications in Th. H. Lunsingh Scheurleer and G.H.M. Posthumus Meyjes (eds), *Leiden University in the Seventeenth Century: An Exchange of Learning*, (Leiden 1975).

<sup>402</sup> See Appendix J, p. 512; H. Stevin, 'Tytels en Cortbegrypen', in *Materiae Politicae: Burgerlicke Stoffen*, (Leiden 1649), pp. 144-147: 'Vanden Hausbau Vervangende mede 't geen noodich is tot bevordering der welvaer, behoudenis en geduerige verbetering van Steden en Landen na des Authuers gevoelen: waerby noch gevoucht is Weechdadelichen Handel van Cammen en Staven in Watermolens en cleytrecking'. This work never appeared but Hendrick Stevin included a part, 'Vanden Handel der Watermolens', in his *Wisconstich Filosofisch Bedryf*. Isaac Beekman also incorporated part in his 'Journael', fol. 198v-206v; see De Waard, *Journal tenu par Isaac Beekman*, vol. II, pp. 406-417.

<sup>403</sup> Huygens, 'Manuscripts' (Adversaria), fol. 163r-179r; see Bierens de Haan, 'Vande Spiegeling der Singconst'.

<sup>404</sup> Bruges, Stadsarchief, Oud Archief, series 109, Verzameling autografen, 1620-1650, no. 215 bis. Letter published in its entirety in A. Schouteet, 'Een brief over het werk van Simon Stevin door zijn zoon Hendrik', in *Handelingen van het Genootschap Société d'Emulation te Brugge*, vol. CI, (1964), pp. 236-239.

letter does not bear an address, but in the nineteenth century an archivist noted on the folder in which it was kept *à Const. Huygens*.<sup>405</sup> Whether the request to see the treatise on architecture did indeed come from Constantijn Huygens is difficult to determine since the archive documents became separated in the same century. Such a request might well have been made by Huygens in 1636 since at that time he was building his house and the year before he had asked for several editions of Vitruvius.<sup>406</sup>

It may be inferred from Hendrick Stevin's reply that the writer of the request had learned about the treatise from the foreword to 'sijn eerst boeck der Deursichtigen te weten vande Verschauwingh' ('his first book on perspective, that is on perspective drawings').<sup>407</sup> Although according to Hendrick Stevin it might be concluded from this that his father had written a complete account, he declared that he had never seen it and that he only possessed part of it. He suspected that this treatise, together with 'den Chrijchshandel' and several other manuscripts, was in the possession of Prince Frederick Henry.<sup>408</sup> Nonetheless, he agreed to send the sections of *Huysbou* that he did have as quickly as possible, an undertaking he would surely only have given to a person of high position.<sup>409</sup>

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<sup>405</sup> Inscription by nineteenth-century archivist on cover: 'Stevin Hendrick/Mathematique distingué/ (fils de Simon Stevin)/ à Const Huygens/ 1 Febr 1636/ Concernant un ouvrage de son père sur l'architecture domestique.' Schouteet says he would rather not speculate as to the identity of the author of the request. It is not clear, however, whether Schouteet overlooked the mention of Huygens on the cover of the folder in which the letter is kept or deliberately omitted it because he doubted that it was right. Schouteet suspects that the letter came into the City Archives through the English collector John Steinmetz, who settled in Bruges at an early age and was to leave various collections to the city. The folder containing the letter does indeed bear a note by J. Steinmetz about a print by Swanenbergh of Stevin's land yacht. However, the handwriting of this note is not the same as that of the notes about the letter. It seems most likely that Steinmetz added a few remarks to the archivist's description of Hendrick Stevin's letter, which was already in the collection at that time. See also Van den Heuvel, 'De Huysbou, de Crychconst en de Wysentijt', p. 47.

<sup>406</sup> See Worp (ed.), *De briefwisseling van Constantijn Huygens*, vol. II, pp. 53-54; no. 1087 and 1088 and p. 182; no. 1417.

<sup>407</sup> It remains unclear whether the anonymous letter writer knew 'Deursichtighe' through the publication of *Wisconstighe Ghedachtenissen* or in the form of a separate manuscript. Hendrick's reply gives the impression that his correspondent was referring explicitly to the treatise on perspective and not to *Wisconstighe Ghedachtenissen* in general, in which *Huysbou* was mentioned several times. This may be a coincidence, but it seems likely that another treatise on architecture was being referred to. It is doubtful for that matter whether Hendrick knew of the possibility that there might be two different treatises on architecture. The remark 'metter geene dat ickker van hebbe' (the part that I have in my possession) suggests, however, that Hendrick was thinking of one and the same treatise.

<sup>408</sup> A Schouteet, 'Een brief', p. 238 mistakenly interprets Hendrick's reference to 'His Excellency' as meaning Maurice. In 1636 Maurice had been dead for over ten years. Frederick Henry must be the person meant.

<sup>409</sup> Hendrick does not say he will send 'the complete treatise as soon as possible', as Schouteet 'Een brief', p. 238 incorrectly claims, but 'mettet gheen dat ickker van hebbe' (what I have of it). Given

*Hendrick Stevin: Eenighe Stucken Der Crychconst Beschreven Deur Simon Stevin (Between 1635/36 and 1643)*

The Royal Library possesses a manuscript written out by Hendrick Stevin entitled 'Eenighe stucken der Crychconst Beschreven Deur Simon Stevin' (KB, 128 A9-11).<sup>410</sup> However, the first fifteen folios deal not with military matters but with town planning – a chapter intended by his father as part of the treatise on architecture. This is apparent from the various lists of contents and from 'Cortbegryp', the synopsis preceding this excerpt:

Seeing that, by grouping many houses together, cities come about that, being well ordered, add to the greater convenience and comfort of the houses, the designing of cities, a matter therefore pertaining to architecture, I shall speak of it as follows.<sup>411</sup>

Thus it was Hendrick Stevin, not his father who decided to include five chapters from 'Vande oirdeningh der steden' in the treatise on the art of warfare. Two closely related manuscripts provide important clues to the date. The first, as the catalogue number KB 129 A 9-1 indicates, is directly connected to 'Eenighe stucken der Crychconst beschreven deur Simon Stevin' and contains a reference to a troop deployment in 1635, a drawing of which Stevin's son had received from the lord of Brederode.<sup>412</sup> The second manuscript resembles the first in form but the contents are more concerned with administrative questions; it was dedicated in 1643 to the subsequent stadholder, William II.<sup>413</sup> This suggests that Hendrick Stevin compiled the manuscript with the extract from Huysbou at some time between 1635 and 1643. The fact that in his letter of 1636 he promised to send the parts of Huysbou he had but failed to mention a copy, may indicate that he had not yet started work on this text.<sup>414</sup>

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that Hendrick complained regularly about his father's texts being dispersed and lost, he would not readily have let them out of his hands.

<sup>410</sup> The Hague, KB, 128-A-9-11, fol. 1r-20v.

<sup>411</sup> S. Stevin, Huysbou, [VIII-Cortbegryp], p. 347, cf. The Hague, KB, 128-A-9-11, fol. 2r.

<sup>412</sup> The Hague, KB, 128-A-9-1 fol. 58v: 'en om daertoe te commen stel ick hier eerst dese form soose int jaer 1635 bij sijn hoogh.t geordonneert was en mij doen ten tijdt bij Sijn Ex.cie den heer van Brederoode gegeven, om uijt te teijckenen'.

<sup>413</sup> The Hague, K.A. CLXXI, 'Gemeene regel op gesanterij. Verhael offmen om wel te regeeren de deucht met boosheijt moet mengen, off datse daer aff onbesmet moet wesen. De Verdrucking?'. Apart from the dedication to Prince William of 6 December 1643, this work contains a letter by Hendrick Stevin of 6 May 1649. The work did not come into the collection of the Royal Netherlands Academy of Arts and Sciences (KNAW) in the same way as Huygens's manuscripts with extracts from Stevin but through the collection of C.A. van Sijpesteyn of Haarlem. It was published by J.P. van Cappelle, 'Maurits en Stevin', *Bijdragen tot de geschiedenis der Nederlanden*, (Haarlem 1827).

<sup>414</sup> The fact that in manuscript 128-A-9-1 Hendrick adds 'doen ten tijdt' (at that time) when referring to 1635 suggests that he did not write this passage until a few years later.

*Catalogue of the Auction of Isaac Beeckman's Books on 14 July 1637*

After Isaac Beeckman's death his library was auctioned at his house on 14 July 1637. The catalogue drawn up for the sale contains only one work on architecture – a Latin edition of Vitruvius. The list of printed works, however, closes with the remark 'met noch eenige packetten' (with some other packets).<sup>415</sup> These were probably manuscripts and may have included texts or copies of *Huysbou*.

*Note of Thanks from Pieter Post to Constantijn Huygens of 18 December 1639*

In a postscript to a note of thanks from Pieter Post to Constantijn Huygens the celebrated architect undertook *aan malcander [te] placken en naijen* (to glue together and sew) a work by Simon Stevin before returning it.<sup>416</sup> Given Pieter Post's profession it is not unlikely that the manuscript he had borrowed from Huygens dealt with architecture. And since Post offered to have the loose pages sewn together, it may, moreover, be assumed that, if this was indeed a copy of *Huysbou* or sections of it, Huygens's copy of Stevin's treatise on architecture must have been a sizeable volume. It is also clear from Post's letter that he had borrowed the work for some time.

*Letters from Constantijn Huygens to Marin Mersenne of 1 April and 3 June 1640 and a List of Questions for a Well Driller*

A manuscript at the British Museum contains extracts from letters written by Constantijn Huygens to Marin Mersenne.<sup>417</sup> The letter of 1 April sets out a detailed method for sinking wells and includes drawings of Stevin's drill as well as a description of the various layers encountered when a depth of 232 feet was reached at Amsterdam's Oudemannenhuis in 1605. The letter of 3 June contains an appendix with several questions put to the well driller Job Adams of Amsterdam at Huygens's request.<sup>418</sup> In his letter to Mersenne of 1 April 1640 Huygens boasted:

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<sup>415</sup> E. Canone, 'Il Catalogus Librorum di Isaac Beeckman', in *Nouvelles de la Republique des Lettres*, (1991), 1, pp. 131-159.

<sup>416</sup> Worp (ed.), *De briefwisseling van Constantijn Huygens*, vol. II, 2285, letter of 18 December 1639: 'Het werck van Steveijn leijt noch los bijeen; sal t wat aen malcander placken en naijen naer gelegentheit, ende mijnheer met den eerste sende. Het soude wel eerder gedaen geweest hebben, soo ick eijmand hadt connen crijghen, die mijn daerin hadt connen helpen'. Worp reads 'Steveijn' as 'Hobeijn' and identifies this as the artist Holbein. Terwen and Ottenheim read it correctly; see Terwen e.a., *Pieter Post*, p. 25.

<sup>417</sup> London, British Museum, Add. ms. 16912 fol 181ff, Worp, III, p. 17.

<sup>418</sup> The text and illustrations of both letters are printed in De Waard (ed.), *Correspondance du P. Marin Mersenne*, vol. IX, pp. 257-261 and 378-384.

Ce mestier tant y a est fort commun icy doresnavant, nommement à Amsterdam et Leyden, où il faut chercher les bonnes eaux plus bas qu'icy, et c'est cette seule remplisseuse d'eau que Stevin (en des pieces de ses mains qui n'ont point encore veu le jour et sont en mon pouvoir) oppose aux plus belles inventions de l'antiquité.<sup>419</sup>

It is clear that these *pieces de ses mains* included at least some parts of *Huysbou*<sup>420</sup> since information explaining the answers to the list of questions was borrowed from the manuscripts of Stevin's treatise on architecture, which according to several lists of contents included 'Van bornputten, pompen, santoringh' as part of the chapter 'Vande onderaertsche werken'. Isaac Beeckman's 'Journael' and Hendrick Stevin's *Materiae Politicae* contain passages from this chapter, but they are less extensive than Huygens's excerpts. The letters to Mersenne correspond, although in a different order, with a Dutch text included in manuscripts by Constantijn Huygens and other authors which were collated in a volume entitled 'Musica, Medica, Physica, Chijmica, Odorifera, Perfumatoria, Fusoria, Coquinaria, Philosophica, Mathematica, Artificialia Constantini Hugenii, Atque Formandarum Et Poliendarum Vitrorum Ad Usam Astro-nomicum' now at the Royal Library in The Hague.<sup>421</sup> This text is probably the original list of questions presented by Huygens to the well driller together with the commentary derived from Stevin's manuscripts of *Huysbou*.<sup>422</sup> The same volume of Huygens's miscellanea contains copies of the treatises by Simon Stevin entitled 'Verrechting van Domeine mette Contrerolle van dien', 'Vande Spiegheling der Singconst' and 'Vande Molens gereviceerd door den Professor

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<sup>419</sup> Ibid., p. 259.

<sup>420</sup> De Waard suspects that Constantijn Huygens came into possession of the copies of 'Vande Singconst', 'Van de verdrucking', 'Verrechting van Domeyne' and finally 'Vande Huysbou' through Hendrick Stevin. While the text on well drilling is indeed derived from Stevin's *Huysbou*, it is not known whether Huygens had copies of all the texts in the *Huysbou*, although this cannot be ruled out.

<sup>421</sup> See Appendix C. The Hague, KB ms. KA XLVII. The manuscripts are part of a large group by Constantijn and Christiaan Huygens which were bought in the spring of 1823 at the request of King William I by the Koninklijk Instituut and subsequently divided between the Koninklijk Instituut, later the Koninklijke Akademie van Wetenschappen, the library of the Leidsche Hogeschool, the Rijksarchief and the Koninklijk Huisarchief. For the purchase and division and a list of the manuscripts bought, see T. Jorissen, 'De Handschriften van Huygens', in *Verslagen en Mededeelingen der Koninklijke Akademie van Wetenschappen, Afdeling Letterkunde*, series II, vol. 3, (Amsterdam 1873), pp. 211-233. The Royal Netherlands Academy of Arts and Sciences (KNAW) gave the collection KA XLVII and various other Huygens manuscripts to the Koninklijke Bibliotheek on permanent loan in 1937; see D.J.H. ter Horst, *Catalogus van de handschriften der Koninklijke Nederlandsche Akademie van Wetenschappen, in bruikleen in de Koninklijke Bibliotheek*, (The Hague 1938).

<sup>422</sup> The Hague, KB, ms. KA XLVII folios 146r-148r. See Appendix C. On this hypothesis see also Van den Heuvel, 'Stevins "Huysbou"', p. 9.

Golius. 1634' discussed above.<sup>423</sup> Constantijn Huygens probably acquired these manuscripts from Hendrick Stevin.<sup>424</sup> It is not clear, however, when Huygens received them, nor whether they came into his possession at the same time.<sup>425</sup> If it was indeed Huygens who had requested to see 'Huysbau' in 1636, he may have received all the texts from the treatise that Stevin's son had promised. Huygens's notes made for *Domus*, the ode to his house which he had begun in 1639, suggest a familiarity with other parts of Stevin's architectural treatise (see Appendix E, below).<sup>426</sup>

*D. Isaaci Beeckmanni Medici et Rectoris apud Dordacenos Mathematico-Physicarum Meditationum, Quaestionum, Solutionum Centuria, 1644*

After his death in 1637 Isaac Beeckman's 'Journal' came into the possession of his brother Abraham. In 1644 the latter published a selection from the years up to 1629<sup>427</sup> containing a number of passages about architecture, including discussions on smoke dispersal, watermills and wooden and stone floors, which may have been derived from Stevin. Isaac Beeckman was generally meticulous in naming his sources, but his brother may have thought that some of the passages on architecture by Simon Stevin were notes by Isaac.

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<sup>423</sup> KB, ms. KA XLVII, fol. 163r-179r: 'Van de Molens gereviceerd door den Professor Golius', (1634), fol. 624r-705r various manuscripts of and about 'De Spiegheling der Singconst', among them fol. 682r-685r, 'Verrechting van Domeine'. The copies in the manuscript KB, ms. KA XLVII. of Simon Stevin's treatises on music and mills and commentaries on them were published in Bierens de Haan, '*Vande Spiegheling der Singconst*'. Bierens de Haan did not, however, identify the passage about wells as consisting of extracts from the Huysbou. For an excellent discussion of Stevin's texts on music, see R. Rasch, *Simon Stevin: De Spiegheling der Singconst* (c. 1608), forthcoming text edition.

<sup>424</sup> The correspondence of Constantijn and Christiaan Huygens shows that Hendrick sent them a few of his father's publications, see Worp (ed.), *De briefwisseling van Constantijn Huygens*, vol. III, no. 3275. On 16 June D. de Wilhem wrote on the subject of two publications on army organisation 'desquels M. Stevin s'est fort servi dans son livre que j'ay presenté de la part de son fils a S.A.'. Worp suggests that the work in question may be *Sterctenbouwing*; in view of the subject, however, the *Castrametatio* is the more likely candidate. In 1660 there was some correspondence between Hendrick and Christiaan Huygens (three letters at the University Library in Leiden, Cod. Huyg. 45). Hendrick's letter to Christiaan Huygens of 21 April 1660, in which he offers a second edition of *Materiae Politicae*, reveals that he had earlier offered a copy of the 1649 edition to Constantijn. See Bierens de Haan e.a. (eds), *Oeuvres complètes de Christiaan Huygens*, vol. III, p. 63.

<sup>425</sup> Rasch, *Simon Stevin: De Spiegheling der Singconst*, p. 18, suspects that Hendrick still had all the excerpts from his father's works in his possession when he died in 1670 and that Constantijn Huygens only obtained them later. It is of course possible that Hendrick sent excerpts at an earlier stage.

<sup>426</sup> On the dating of the manuscript see Kamphuis, 'Constantijn Huygens', p. 154.

<sup>427</sup> A. Beeckman, *D. Isaaci Beeckmanni Medici et Rectoris apud Dordacenos Mathematico-physicarum Meditationum, Quaestionum, Solutionum Centuria*, (Utrecht 1644); copy at University Library in Leiden.



When Hendrick Stevin decided to publish some of his father's unfinished manuscripts originally meant for *Wisconstighe Ghedachtenissen*, he did not envisage an enlarged reissue of that work but rather a selection in his *Materiae Politicae*.<sup>428</sup> In a preface he set out his reasons for this choice.

Given that it was not the intention to reprint the original edition of *Wisconstighe Ghedachtenissen* which is arranged according to the writer's own wishes, rather to add those [parts] that I will be judged to have confused rather more than saved, and to separate these, publishing them individually to distinguish the one from the other [...] I have not considered myself to be bound to the order of some of the pieces or parts as described in the summary of the fifth section of the aforementioned first edition, but have arranged these as I deemed necessary in the circumstances and according to their internal logic.<sup>429</sup>

This fairly free version also included the treatise on town planning which Hendrick Stevin had included in his copy 'Eenighe stucken der Crychconst', although with some changes to the sequence and editing of the text. 'Onder-scheyt van de Oirdening der Steden' was now followed by other excerpts from *Huysbou* grouped under the title 'Byvough der stedenoirdening, vande oirdening der deelen eens huys met 't gheende daer ancleeft'. Simon Stevin had attached appendices to many of his works, but it was probably his son's own initiative to include various chapters from *Huysbou* in a separate supplement, as indicated in his explanatory note.<sup>430</sup>

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<sup>428</sup> The full title is: *Materiae Politicae Burgherlicke Stoffen Vervangbende Ghedachtenissen der Oeffeninghen des Doorluchtichsten Prince Maurits van Orangie, &c. Gouverneur, Opperste Velt-Heer, Admiraal-Generael vande Verenichde Nederlanden, &c. Beschreven deur Simon Stevin van Brugge, Superintendent van zijne Finance, Quartiermeester Generael van 't Leger, &c. En nyt zijn naegelate Hantschriften by een gestelt door Sijn Soon Hendrick Stevin, Heere van Alphen, van Schrevelsrecht, &c. Gedrukt tot Leyden*, (Leiden 1649).

<sup>429</sup> H. Stevin, 'An den leser', in *Materiae Politicae: Burgherlicke Stoffen*, (Leiden 1649), unnumbered [p. 1]: 'Ghemercht het voornemen niet en was de eerstgedruckte Wisconstighe Ghedachtenissen, welke na des Schrijvers eyntlicke meyning gheschickt sijn, te herdrucken, om de ghene, die door my lichtelick meer verwacht dan gheredt sullen gheoirdeelt worden te sijn, daer by te voughen; Maer dese die afgescheyden, besonderlick uyt te gheven, om tusschen d'een en d'ander een merckelick onderscheyt te maken. [...] soo heb ick my an d'oirden die sommige der stucken of deelen van dien in 't Cortbegrijp des vijfden Stux der selve eerstghedruckte, ghegheven was, niet ghenootsaeckt gevonden te verbinden, maer die na 't ghene my de omstandigheden en eyghen beweghinghen schenen te vereysschen, geschickt'.

<sup>430</sup> This was earlier suggested by E.R.M. Taverne, 'Architecturae domesticae Stevini synopsis', in *Bouwen in Nederland, Vijfentwintig opstellen over Nederlandse architectuur opgedragen aan Prof. Ir. J.J. Terwen: Leids Kunsthistorisch Jaarboek* (1984), pp. 441-455, esp. 444.

The above contains a description of most of the planning relevant to government policy. But given the extensive use made of house ordering by burghers individually I shall attach this appendix as an addition to 'Steden', although as I say, only as much of it as any healthy mind (even with no knowledge or love of mathematics) is able to read and understand, while the actual work of construction and other circumstances are fully described in *Huysbou*.<sup>431</sup>

It may be inferred from this that Stevin's son viewed town planning primarily as a political and organisational matter. In fact Stevin himself had emphasised this aspect. In 'Vande oirdeningh der steden' he had pointed to the significance of the centralisation of administrative power in a large city, giving this notion architectural shape in the form of a palace or *Vorstelycke Huys* in which the various administrative departments were combined. However, his son decided to separate what Stevin had envisaged as components of a larger entity. He extracted the architectural description of the palace from *Huysbou* and added it to a separate work on administrative organisations in *Materiae Politicae* entitled 'III onderscheyt der Radenoirden'.<sup>432</sup>

Hendrick Stevin's explanation also reveals that he possessed other sections of *Huysbou* which he had decided to omit for the time being.<sup>433</sup> Like his father, Hendrick Stevin intended at some date to publish a complete *Huysbou*.<sup>434</sup> This probably explains why he limited *Materiae Politicae* to planning, organisation and other matters linked to government policy. On the subject of construction, which formed an integral part of his father's treatise on architecture,

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<sup>431</sup> H. Stevin, 'Byvough', p. 40: 'Int voorgaende is meest oirdening beschreven, waer van het beleyt den Overheden toebehoort. Maer anghemerckt het groot gebruyck dat de huysoordening onder de Burgerijen by elck een heeft, so sal ick daer af, als anhangsel der Steden, desen Byvoug formen; Doch, gelijck ick segge, alleenlick soo veel vant selve, als yder gesont oirdeel (al en isser geen kennis noch genegentheydt totte Wisconsten by) dat lesende, verstaen can: Waer af het dadelick maecksel en ander omstandigen inden eyghentlicken Huysbou beschreven sijn'.

<sup>432</sup> Ibid., p. 72: 'Den Schrijver [Simon Stevin] had hier noch ongheteyckent, dat hy van meyning was hier noch verhael te doen van een Vorstlick huys met al sijn vergaringhen daerby, hebbende elcke vergaring een lichtplaets mette huysing rontsom ten eynde te ghenieten de ghemacken en voordeelen daer af by t' laest van 1 Hooftstick der volghenden 3 Onderscheyts, van der Radenoirden, af gheseyt sal worden, en int 4 Hooftstick der voorgaende Stedenoirdening oock enich vermaen geschiet is'.

<sup>433</sup> This appears to be confirmed by yet more sections of *Materiae Politicae* in which reference is made to *Huysbou*: pp. 57, 62, 65, 98, 104, 118. These references occur in both Hendrick's annotations indicated by 'H.S.' and in the copy of his father's text.

<sup>434</sup> See Appendix E, p. 492; H. Stevin, 'Onderscheyt van de Oirdeningh der Steden', p. 25: 'Dit is 't geene [the preceding passage is a lengthy discussion of the concept of mirror symmetry] over ick hier uyt het gemelte eerste Hooftstick der huysbou in der Stedenoirdening heb willen brengen (om den gront des woorts Lycksijdichey na de meyning des Schrijvers te verstaen) daer van den rest mettet uytgaen der selver huysbou sal volgen' and p. 65 'Dus verre vande vervouging der camers of percken die 't Samen het heel huys maken, de rest sal metten huysbou vervult worden'.

he referred the reader to the future publication.<sup>435</sup> But Hendrick Stevin also failed to publish a comprehensive *Huysbou*. The main reason was probably the lack of coherence in the remaining passages. The publication in *Materiae Politicae* of excerpts from his father's unfinished works, including *Huysbou*, was intended in part to stimulate the search for lost manuscripts with which to complete these texts. He even stated magnanimously that 'we are therefore willing to renounce any rights to patents in cases, proven or shown not to have originated in any of the late writer's manuscripts presently under our care, but from one of the aforementioned missing manuscripts'.<sup>436</sup> It is unclear whether this gesture produced any response, although *Wisconstich Filosofisch Bedryf* was in fact to include a number of texts from the architectural treatise not contained in *Materiae Politicae*.

### *Hendrick Stevin's Wisconstich Filosofisch Bedryf, 1667*

In *Materiae Politicae* Hendrick Stevin had attempted to include as many excerpts from his father's manuscripts as the subject of the work would allow. In *Wisconstich Filosofisch Bedryf*, which appeared nearly twenty years later, he reflected on the rationale behind the first publication.

[...] that we were able to gather the manuscripts (which had, through neglect, been entrusted these many years to various learned hands, without anything else to our knowledge being done with them, having been taken out of numerous completed volumes, about which we consider ourselves to have adequate knowledge, and the rest being indiscriminately dispersed far and wide) sufficiently for our purposes to be able to arrive at certain compilations and eventually to compile a book which we had printed over a period of eighteen years under the title *Burgelicke Stoffen*.<sup>437</sup>

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<sup>435</sup> A few texts by Simon Stevin entitled 'Weechdadelicken Handel van Cammen en Staven in Watermolens' and 'Cleytrecking' which Hendrick had announced in the introduction to *Materiae Politicae* were also not included in this work in the end. However, these texts probably did not originally belong to *Huysbou*.

<sup>436</sup> H. Stevin, *Materiae Politicae* unnumbered [p. 4]: 'An den leser', 'wy daerom geeren 't genot des Octroys [...] willen afstaen; Welverstaende in ghevalle bewesen of ons verthoont wordt die na des Schrijvers overlijden oirsproncelick niet ghecommen te wesen uyt des selfs handschriften, jegenwoordigh onder ons berustende, maer uyt eenighe der voorschreve vermiste'.

<sup>437</sup> H. Stevin, 'Vant geen den Schryver bewogen heeft in leec bedrijf naer wijsheyt om te sien', in *Wisconstich Filosofisch Bedryf van Hendrik Stevin*, (Leiden 1667), p. 5: '[...] dat wy de handschriften (welcke nu deur onachtsaemehey, al veel jaren onder verscheyden geleerde handen waren vertrouwt, sonder yets anders, onses wetens, daer me verricht te zijn, als datse van vele voltrockene delen, daer wy genoegsame kennis af menen te hebben, geledigt, en sulx de rest heel ongeret wijt en zijt deur malcander verstroyt waren) naer ons de saec genoegsaem docht te mogen lyen tot sekere bij een comsten brachten: Ende eyntlic daer uyt een boek Schifteden, dat wy al over actien jaren onder naem van Burgelicke Stoffen liet drucken'.

In the second section on statics, ‘Van Der Eertsche Stoffen Stercteconst’, Hendrick Stevin explained that direct access to his father’s manuscripts had been given to Isaac Beeckman’s brother Abraham.

Our brother Frederic Stevin of blessed memory, who, in his youth some thirty years ago, studied under a certain Abraham Beecman, then rector in Rotterdam and a great amateur of mathematics, may have given our father Simon Stevin’s manuscripts which our mother then still had (of which many of the foremost she had already thoughtlessly allowed to be selected) to Beecman at that time – from which he copied a range of material in a book of other of his own observations, including various considerations concerning watermills and other works with cogs and staves which we shall discuss at another time and place. The copy of these observations sent to us by Beecman contained the following story: wood is more than four times stronger than when cut in quarters. Stevin had written a proposal to the dyke master and local council of Schieland, with respect to the mill at Kralingen.<sup>438</sup>

But it was probably Isaac Beeckman, not his brother Abraham, whom Frederik Stevin introduced to his mother.<sup>439</sup> It is also unlikely that Frederik Stevin had been a student in Rotterdam thirty years before the publication of *Wisconstich Filosofisch Bedryf*. In 1637 he was twenty-four years old and had just obtained his doctorate or was at the point of doing so. In the 1620s, he had attended Jacob Beeckman’s Latin school in Rotterdam, where the latter

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<sup>438</sup> H. Stevin, *Wisconstich Filosofisch Bedryf van Hendrik Stevin*, (Leiden 1667), book II, fol. 3: ‘Hebbende ons Broeder Frederic Stevin zal., in syn joncheyt, geleden ontrent dertich jaren, ter studi gelegen bij enen Heer Abraham Beecman, doen Rector tot Rotterdam, en groot liefhebber der Wisconsten; hadde hy Beecman, by die gelegenthey, de hantschriften onses Vaders Simon Stevin, die onder ons Moeder doen noch overich waren (zijnde deur haer onbedacht toelaten te voren al van vele der voornaemste gesift) ooc in hande gekregen; En daeruyt verscheyde stoffen in een boec van meer andere zijnder eygen aenteykeningen overgedragen: En onder anderen ettelicke gedachtenissen van watermolens en ander cam en staefwer, dat wij t’ zijnder tijt en plaets hier of elders menen op te geven. Van welke aenteykeningen Beecmans, ons afschrift toegesonden wesende, vonden daer onder dit verhael van hem Beecman: Hout is meer dan viermaal sterker dan syn geclooft vierendeel Stevin heeft een voorstel geschreven aen de Dycgraef en Heemraden van Schielant, ter occasie vande Meule te Cralingen’

<sup>439</sup> In *Bibliotheca Belgica, Bibliographie Générale des Pays-Bas*, vol. V, Abraham Beeckman is cited as the copyist of Simon Stevin’s works. De Waard and Van Berkel have suggested – correctly in my view – that this was actually Isaac. Hendrick probably got the first name wrong. Abraham Beeckman did not become headmaster in Rotterdam until 1652 and cannot possibly have taught Frederik Stevin, who was born in 1613. Van Berkel, *Isaac Beeckman*, p. 61, mentions Abraham’s departure in 1652 from Goes to become headmaster in Rotterdam. According to a register of the University of Leiden, Frederik was 26 when he was admitted as a student in mathematics in 1639. He had previously studied theology (registered in 1629) and he had obtained a doctorate in law. For the register see W.J.C. Rammelman Elsevier, *Navorscher* (1852), vol. 2, pp. 68-69.

was indeed headmaster at that time.<sup>440</sup> There Frederik Stevin would certainly have met Isaac Beeckman, who assisted at the school. So the ‘book of observations’ probably refers to Isaac Beeckman’s ‘Journael’. Abraham Beeckman sent a copy of it to Hendrick Stevin, which may have led to the confusion about the names.<sup>441</sup> Several passages from *Wisconstich Filosofisch Bedryf* concern architecture in a broad sense. For a discussion of his ‘ontrent de maten en het gebruyck der pilaren’ (‘on the sizes and uses of columns’) Hendrick Stevin referred the reader to *Materiae Politicae* and confined himself to a few brief propositions regarding forces in columns that were perhaps more suited to a work on statics, such as Stevin’s ‘Stercteconst’, than to *Huysbou*.<sup>442</sup> At another point in *Wisconstich Filosofisch Bedryf*, in the ‘Vanden Handel der Waterschuyring Onses Vaders Simon Stevin’, the introduction to this text on maintaining the depth of water reveals that this topic was originally thought of as a subject of architecture.<sup>443</sup>

*Alexis Brialmont, Les Oeuvres Militaires De Simon Stevin, 1846*

In his survey of Simon Stevin’s military works Alexis Brialmont, an engineer in the Belgian army, also considered the excerpts from *Huysbou* in *Materiae Politicae*.<sup>444</sup> In ‘De l’ordonnance des villes’ and ‘De l’ordonnance des maisons’ he kept to the same arrangement as Hendrik Stevin. Interestingly, however, he tried to reconstruct the contents of the unpublished excerpts on the basis of ‘Tytels en Cortbegrypen’ which Hendrick Stevin had included elsewhere in his work. Thus Brialmont noted that the chapters listed on *batardeaux et des digues*,

<sup>440</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol.1, p. xxxi and Dijksterhuis, *Simon Stevin*, p. 22, n.7, pointed out that one should read Jacob for Abraham.

<sup>441</sup> Although Abraham had published notes by Isaac Beeckman, the words ‘boec van meer andere zijnder eygen aenteekeningen’ do not refer to this printed work by Abraham but to the manuscript by Isaac himself. Some extracts which Hendrick copied from the copy sent to him, ‘ettelicke gedachtenissen van watermolens en ander cam en staefwerck’, are indeed discussed in Isaac Beeckman’s ‘Journael’.

<sup>442</sup> There are also discourses on topics that are based on, or otherwise related to, Simon Stevin’s writings on architecture but which were written by Hendrick. Thus the calls for the enclosing and draining of the Zuiderzee, the waters of Zeeland and the ‘Maesche watergronden’, correspond both to Stevin’s ‘hoe men om ’t verdrincken der Steden en dorpen te voorkomen, bedijckte landen doet hooger wassen die daerne oock veel vruchtbaerder zijn’ and to passages from ‘Waterschuyring’.

<sup>443</sup> S. Stevin, *Huysbou*, [VIII-4], p. 000; cf. H Stevin, ‘Vanden handel der Waterschuyring’, [fol. 37], in *The Principal Works of Simon Stevin*, vol. V, p. 205: ‘Angesien veel Huysen, Schansen ende Steden, gebout worden op bedijckte landen, alwaer kennis vande gemene eygenschap der schuyring vorderlick is, soo sal ic nu daer af als totten huysbou gehoorende wat seggen’ / ‘As many houses, redoubts and towns are built on embanked lands, for which knowledge of the general properties of scouring is helpful, I will now say something on this matter, since it pertains to architecture.’

<sup>444</sup> A. Brialmont, ‘Oeuvres militaires de Simon Stevin’, pp. 135-142.

by which he probably meant Stevin's discussions of dams and dykes, were the earliest known works on this subject. He regretted the loss of these texts, which would have been of the greatest importance for *l'art des constructions*, especially since this was due to the negligence of Stevin's heirs. Here Brialmont was perhaps unfair to Hendrick Stevin, who had taken trouble to preserve his father's work and to reconstruct it where necessary. Brialmont would no doubt have been pleased if he had been able to read Hendrick Stevin's manuscripts in which he presented *Huysbou* as part of the art of warfare.

*The publication of Beeckman's Notes on the Work of Stevin, 1905-1953*

In June 1905 the historian Cornelis de Waard of Zeeland found Isaac Beeckman's supposedly lost 'Journael' at Middelburg's provincial library (now the Zeeuwse Bibliotheek). He used information from it in a brief article on Descartes and the law of refraction and informed his professor, Diederik Johannes Korteweg, of his discovery.<sup>445</sup> Korteweg was the first to recognise the importance of the manuscript, which showed that Descartes' scientific career went back ten years earlier than had previously been thought. He contacted Charles Adam in Nancy, who was working on an edition of Descartes' oeuvre and to whom the work was in fact temporarily loaned. When on 19 May 1906 Korteweg proposed to the Dutch scientific society *Hollandsche Maatschappij der Wetenschappen* that Beeckman's 'Journael' should be published in its entirety he was able to count on the support of several eminent scholars at home and abroad. He introduced his proposal with a lecture on Descartes and Beeckman's scientific observations.<sup>446</sup> Interestingly, the secretary of the society, Johannes Bosscha, lent weight to Korteweg's proposal by pointing out in a supplementary address the value of Beeckman's 'Journael' as a source of information on Stevin's work.

If today an unknown manuscript by Galileo were to be found in some forgotten corner of a library, its publication would certainly be demanded; should we in the Low Countries then be in doubt when in Beeckman's 'Journael' a work by Simon Stevin is found – a man who in terms not of fame among the profanum vulgus but of true services to science stands far above Galileo?

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<sup>445</sup> De Waard immediately published a short extract entitled 'Descartes en de brekingswet' in *Nieuw Archief voor Wetenschap*, 2nd series, vol. 7, (1905), pp. 64-68.

<sup>446</sup> D.J. Korteweg's plea for publication in full of the 'Journael' appeared in *Archives Néerlandaises des Sciences Exactes et Naturelles publiées par La Société Hollandaise des Sciences à Harlem*, series II, vol. XI (The Hague 1906), p. v. The Dutch version in manuscript is in folder 1906 of the *Hollandse Maatschappij der Wetenschappen* in Haarlem under the title 'Descartes en het Journaal van Beeckman'.

Bosscha's eloquence persuaded his audience and it was decided to grant De Waard a sum with which to employ an assistant to make a copy.<sup>447</sup> In 1908, when a third of the transcription had been completed, signs of disappointment among the board became evident, especially regarding Stevin's texts. Bosscha, who drew up a thorough inventory of Beeckman's copies of Stevin, was forced to concede that several texts had already been published by Hendrick Stevin and Bierens de Haan.<sup>448</sup> As a result, and because of the difficulty in deciphering the manuscript, Bosscha gradually began to press for a 'careful selection' of the material.<sup>449</sup>

The matter was shelved for nearly thirty years until 1937, when De Waard wrote to the *Hollandsche Maatschappij* to announce that Nijhoff were prepared to publish the work. The society gave permission for publication of Beeckman's manuscript 'of which our society had a copy made at the time which is in his [De Waard's] hands', but added that it was not able to provide finance.<sup>450</sup>

Beeckman's 'Journal' finally appeared in four volumes between 1939 and 1953. Unfortunately the manuscript was damaged by water when a major fire at the library was extinguished during the Second World War rendering it virtually illegible. In fact the loss was all the more unfortunate because De Waard, possibly influenced by Bosscha's advice to make a stricter selection, had transcribed only those excerpts from Stevin's manuscripts which he believed had not been published earlier. Although he indicated where these other excerpts could be found, the texts in the manuscript and printed versions often do not correspond. This is probably why Dijksterhuis, who compiled his celebrated study during the war, applied to De Waard for permission to see the original transcript of Beeckman's 'Journal' with the copies of Stevin's texts. De Waard replied that he was not sure whether he still had the texts but that if they had been preserved they would be at his house in Veere, which he had been forced to abandon.<sup>451</sup> In the final volume of his edition in 1953 De Waard thanked the *Hollandsche Maatschappij* for lending him a copy of the transcript. It is not known whether, and if so when, he returned it; either way, it is not there

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<sup>447</sup> De Waard received a grant of 500 guilders and the transcription was to be done by a member of staff at the Haarlem archives.

<sup>448</sup> *Archives Néerlandaises des Sciences Exactes et Naturelles publiées par La Société Hollandaise des Sciences à Harlem*, series II, vol. XIII, (The Hague 1908), pp. II-III. The detailed inventory of various printed works by Stevin and of Beeckman's copies of his works is included in the 1906 application in the archives of the *Hollandse Maatschappij der Wetenschappen*.

<sup>449</sup> *Hollandse Maatschappij der Wetenschappen*, minutes of the meeting of the executive, 10 March 1910.

<sup>450</sup> *Hollandse Maatschappij der Wetenschappen*, minutes of the executive, Nov. 1937, p. 14.

<sup>451</sup> Leiden, Museum Boerhaave, Dijksterhuis archive, S 10.453, archive 471, 17ob.

now. Nor is it known whether this copy contained the *Huysbou* passages which De Waard had omitted from his edition. Whatever the contents of the lost copy, these passages have now been transcribed from the damaged original of Beeckman's 'Journael' and added to the excerpts published by De Waard.<sup>452</sup>

That excerpts from Stevin's unfinished works were circulating among scholars soon after his death suggests that his writings excited keen interest. The commentaries by Isaac Beeckman, Hendrick Stevin and Constantijn and Christiaan Huygens show that this interest also extended to his views on architecture and town planning. Why Stevin himself did not succeed in forging a book out of the texts on this subject remains puzzling. It was probably the criticism it encountered from contemporaries that persuaded Stevin not to publish his 'Spiegelingh Der Singconst'. In the case of *Crychsconst* and *Huysbou* it seems that it was Stevin himself who, taking a near purist attitude, blocked publication. Remarks such as 'so that it is not placed under numerous other subjects that are discussed here and so that understanding is not blurred by dispute' are regularly found in his works.<sup>453</sup> Stevin tried to present the material as clearly as possible by leaving out comments of marginal relevance. In *Crychsconst* and *Huysbou*, in which he covered a large variety of topics, this was a near impossible task. Apart from the diversity of the chapters themselves, Stevin also had the problem of overlapping texts. Certain subjects, particularly those related to hydraulic engineering, were connected to both civil and military government. Doubtless Stevin often asked himself whether a particular text belonged in *Crychsconst* or in *Huysbou*. This indecision makes it all the harder to discover how Stevin envisaged the final form of *Huysbou*, although a comparison of the various lists of contents with the different copies and printed texts may throw more light on this mystery.

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<sup>452</sup> See Appendix A.

<sup>453</sup> 'Op dattet niet staende onder veel ander stoffen die niet ygelickx gading en zijn' or 'op dat leeringh met gheen sryding verduystert worden'.



## 9. The first Huysbou reconstructions

*Interspersed, far and wide [...]*<sup>454</sup>

*Isaac Beeckman: Noting that which I consider best and most useful*<sup>455</sup>

In 1624, having drawn up an inventory of Simon Stevin's manuscripts, Isaac Beeckman proceeded to add lists of the contents of selected items in his 'Journael'. In fact, the contents of Huysbou were probably not copied from an original manuscript on architecture but compiled by Beeckman himself, since he remarked that he had begun to examine 'Simon Stevin's papers and to make a note of the best and the most deserving on 18 September 1624, apart from *Huysbou* which I had examined some months earlier and which was copied on different paper [...]'.<sup>456</sup> Beeckman's summary of the contents of *Huysbou* is the earliest to have survived and forms the principal basis for the reconstruction of the work.

It is noticeable that several of the chapters listed for *Huysbou* correspond – although in a different order – to titles in the inventory of manuscripts, such as 'Ordering der Steden' (23), 'Solders en Overwelfsels' (24), 'Metselrije, timmerinck, smedingh, roock' (25), 'Huysbou' (26) and 'Van Steygers' (27).<sup>457</sup> It seems, therefore, that when Beeckman first examined the manuscripts he thought he was dealing with separate texts. Little else can be garnered from the inventory, other than that the titles appear to correspond to parts of *Huysbou* which had been worked up in some detail and which were separately batched. It is interesting that Beeckman listed one of these items under the heading 'Huysbou'. Was this a separate essay on architecture or just part of the more

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<sup>454</sup> H. Stevin, *Wisconstich Filosofisch Bedrijf*, I, p. 5: 'Wijt en zijt deur malcander verstroyt'.

<sup>455</sup> 'I. Beeckman 'Journael', fol. 198v.; De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 305: 'ende hier te noteren t'gene ick best achte ende dienstelickxt.'

<sup>456</sup> I. Beeckman 'Journael', fol. 198v.; De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 305: 'Symons Stevyn's pampieren hebbe ick beginnen te ondersoucken [...], den 18en Sept. 1624, behalven den Huysbou, dewelcke ick eenighe maenden te vooren ondersocht hebbe, ende op ander pampieren uytgeteeckent, dat my goet docht'.

<sup>457</sup> See Appendix F.

comprehensive treatise that Stevin had intended to publish under this title? While he probably intended to include a chapter entitled ‘Van de Huysbou’ in his *Wisconstige Ghedachtenissen*, Stevin had already written a work with a similar title for private use. Although it is possible that this was that early work, it seems more likely that Beeckman gave the title ‘Huysbou’ to the texts intended for the chapter ‘Van de oirdeningh der deelen eens huys als der camers lichtplaetsen, gaelderyen, hoven blocken ende ten laesten der deelen welcke een camer heeft’. The text has numerous subheadings and this may have led Beeckman to consider it to be a separate work. Moreover, the manuscript inventory also includes other chapters from *Huysbou*. The four final chapters and *Verscheyden aenteckeningen*, the contents of which correspond to ‘Metselrije, timmerinck, smedingh, roock’ (25), may therefore represent sections of the unfinished treatise in an advanced state of preparation.

Beeckman did not include the first three chapters – ‘Vande lycksydicheyt des gebous’, ‘Van de onderaertsche werken’ and ‘Van de gevels’, together with the appendix ‘Aenteyckeningen op Serlyns en andere’ – in his inventory. He may have considered these to be subsections of one or more of the inventory items, which therefore did not qualify for separate mention.<sup>458</sup>

Together with his excerpts and commentaries, Isaac Beeckman’s inventory and list of contents help form a picture of *Huysbou*. It appears to have been one single work, even though in his ‘Journael’ Beeckman sometimes referred to papers relating to ‘Huysbouw’ and sometimes to ‘Boukonst’ (see Appendix E, below).<sup>459</sup> Yet while these excerpts and Beeckman’s accompanying commentaries offer clues to the content of Stevin’s treatise, the basis they provide is insufficient for an accurate reconstruction. To establish the original structure of *Huysbou* it is necessary to compare Beeckman’s list of contents with those that others compiled.

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<sup>458</sup> For example, the passage about mirror symmetry is not especially long and it is even possible that Beeckman initially thought it belonged with the other notes of a theoretical nature referred to as ‘Aenteckeningen op Serlyns en andere’. These ‘aenteckeningen’ and those on building methods might together correspond to the heading ‘verscheyden aenteckeningen’ in the list. The text on pumps which Beeckman listed under the title ‘Van watermolens en pompen’ may originally have belonged to the ‘onderaertsche werken’, which was also supposed to have a passage about pumps; he may have believed that the texts belonged to the treatise on the city. It is also possible that he originally thought that the incomplete texts about façades belonged to the fragment about the arrangement of the dwelling.

<sup>459</sup> Beeckman, ‘Journael’, fol. 194r, 194v, 195v, 198v and 263v; De Waard, *Journal tenu par Isaac Beeckman*, vol. II, pp. 292, 293, 294, 296-97, 298 and 382. The fact that ‘Boukonst’ is not mentioned as a separate work in either the inventory or the list of contents makes it likely that Beeckman was using this term to refer to *Huysbou*.

Three summaries of contents (Cortbegrypen)

Simon Stevin's son Hendrick made no less than two *cortbegrypen* (summaries of contents) of parts of *Huysbou* and a third for a reconstruction of the whole treatise.<sup>460</sup> In fact these differ significantly not only from those compiled by Isaac Beeckman but also from one another. Although Hendrick Stevin's handwritten summaries probably predate his attempt to reconstruct *Huysbou* in *Materiae Politicae*, the latter work, being complete, lends itself better to a comparison with Isaac Beeckman's overview.

*Materiae Politicae*, 1649

Hendrick Stevin used the first two brief lists of contents to show the sequence of his handwritten and printed excerpts from *Huysbou*, but his third, complete overview served a different purpose. In his introduction at the start of *Materiae Politicae* he noted that the inclusion of a table of contents might 'in due course persuade owners of the aforementioned missing pieces, of which we have neither content nor form, to signal this'.<sup>461</sup>

In the general synopsis of *Materiae Politicae*, Stevin's writings on architecture appear under the title 'Van Den Huysbau Vervangende mede 't geen noodich is tot bevordering der welvaer, behoudenis en geduerige verbetering van Steden en Landen na des Authuers gevoelen: waerby noch gevoucht is Weechdadelichen Handel van Cammen en Staven in Watermolens en cleytrecking. Cortbegryp. Deze Huysbou sal hebben 16 Hooftsticken'.<sup>462</sup>

The sixteen chapters of this version of *Huysbou* contrast starkly with Beeckman's nine. Indeed, Hendrick Stevin even considered a seventeenth chapter which he evidently thought suitable, although not originally intended for *Huysbou*.<sup>463</sup> While Beeckman had sufficed with a provisional list of contents

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<sup>460</sup> See Appendices H, I and J, KB, 128-A-9-II, fol. 2r, H. Stevin, 'Onderscheyt van de Oirdeningh der Steden', p. 6, 'Byvouch', p. 40 and 'Tytels en Cortbegrypen', pp. 144-147.

<sup>461</sup> H. Stevin, *Materiae Politicae* unnumbered [p. 4]: 'An den leser': 'de Besitters der meergheelte vermiste stucken, siende wat ons soo in stof als form ghebreeckt, mochten bewoghen worden tijdelick anwijsingh daer af te doen'.

<sup>462</sup> See Appendix J, p. 509.

<sup>463</sup> See Appendix J, p. 512. In addition to the text on 'Cammen en Staven in Watermolens' and 'Cleytrecking', the seventeenth chapter was to include several descriptions of methods for improving the towns of Danzig, Elbing, Breunsberg, Rijnberck, Deventer, Zutphen, Schiedam and Linge. Although this chapter was not finally put in the *Huysbou*, it may be that Stevin considered incorporating elements from it into his architecture treatise. Thus the passage 'Houdt is meer dan viermael sterker dan syn geklooven vierendeel', which Beeckman copied into his *Journal* from the texts on

of *Huysbou* and had then copied those passages that seemed worth studying in greater detail, Hendrick Stevin, as indicated in the introduction, seems instead to have aimed at a complete reconstruction. This was not to be a literal copy of *Huysbou*, but rather an overview of the various themes in architecture and town planning that his father had discussed. It was in fact a new *Huysbou* compiled by Hendrick Stevin *na des Autheurs gevoelen* ('as the author intended'), to which he added new elements as he saw fit.

Some of the subsections in Beeckman's overview were promoted to separate chapters by Hendrick Stevin. He also included chapter titles which were not recorded by Beeckman. These include 'Van de manier des gebouws om versekert te zijn tegen brandt' (6), 'Vande oirdening der kercken en tuchthuysen' (10), 'Van de hechting van hout en steen' (12) and 'Van de waterschuyring' (16).

'Vande oirdening der kercken en tuchthuysen' probably consisted of little more than a few notes.<sup>464</sup> Any additional material would certainly have been discussed by the pious Isaac Beeckman, who took a keen interest in church buildings. Clearly, either they were not among the manuscripts he examined or he did not regard them as separate texts. If the latter, this section may have formed part of the chapter 'Form der steden', in which Stevin referred briefly to the accessibility of churches and mentioned a *tuchthuis* among the various public buildings.<sup>465</sup> 'Van de manier des gebouws om versekert te zijn tegen brandt' and 'Van de hechting van hout en steen' probably consisted of short passages which Beeckman had taken for parts of other chapters but which Hendrick Stevin gave new titles. More remarkable is the latter's introduction to the sixteenth chapter 'Van de waterschuyring', which was eventually included not in *Materiae Politicae* but in *Wisconstich Filosofisch Bedryf*: from his remarks it is apparent that Simon Stevin had included parts in 'Eertclootschrift' and *Nieuwe Maniere van Sterctebou door Spilsluysen*, but that it originally belonged to *Huysbou*.<sup>466</sup>

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'Cammen en staven, Watermolens en pompen, cleytrecking', also occurs in a shorter version in his copy of the *Huysbou*. Cf. De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. XII and Appendice 1, p. 401.

<sup>464</sup> Only one remark about churches is known. This is a comparison between vaults in a house and in a church. See S. Stevin *Huysbou* [v-3], p. 287 and I. Beeckman fol. 232r lines 14-19.

<sup>465</sup> Taverne envisaged this chapter in another position as part of 'Van de oirdening der deelen eens huys': Taverne, 'Architecturae domesticae Stevini synopsis', p. 452.

<sup>466</sup> H. Stevin, *Wisconstich Filosofisch Bedryf*, XI, p. 36: 'Want wij ons, met dese overleggingen der waterschuyring onses Vaders (die hy in sijn *Huysbou* te pas had gebracht) gevoegt tot sijn Eertclootstofroersel en nieuwe manier van Sterctebou door Spilsluysen, by hem selven voor sijn overlijden uytgegeven, van veel omstandigen die wij andersins aan ons voornemen te volbrengen, wel souden dienen over te halen; So hebben wy goet gedacht of dit 11 Boec te maken, als zijnde gelyc ook

Even before the publication of ‘XI Boec Van Den Handel Der Waterschuyring Onses Vaders’ in *Wisconstich Filosofisch Bedryf*, large sections of this work were already known. Besides the excerpts that Stevin published during his lifetime, some passages also appeared in Beeckman’s ‘Journael’. Although he did not include ‘Van de waterschuyring’ as a separate title in the inventory of the surviving manuscripts, parts of it can be identified in ‘Calis int groot afgebeeld’ (6) and ‘Santplate te Danzick’ (18). Moreover, he wrote the term *waterschueringh* in the margin beside a number of passages about currents in rivers, estuaries and creeks.<sup>467</sup>

Presumably Beeckman thought these excerpts were intended for a separate work, but did not include them in the list of surviving manuscripts since they probably seemed too disparate.<sup>468</sup> Stevin’s son, on the other hand, regarded them as part of *Huysbou* and accordingly listed them as the sixteenth chapter of the treatise.

The fact that in their lists of contents both Isaac Beeckman and Hendrick Stevin included titles concerning water scouring in the same place in the chapter ‘Van de oirdeningh der steden’ suggests that Stevin himself had also added various items on this subject to the discourse on town planning.<sup>469</sup> His son was certainly interested in these passages, although he placed the emphasis on entirely different aspects of the subject.

#### *Hendrick Stevin’s manuscript and printed excerpts from Huysbou*

In his introduction to ‘Eenighe stucken der Crychconst Beschreven Deur Simon Stevin’ Hendrick Stevin explained that some passages from *Huysbou* on town planning were included in this treatise on art of warfare because they contained drawings and fragments of texts on the fortification of rectangular

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’t voorgaende 10 Boec, in so veel ons bedrijf, dat wij ons daer in geoeffent hebben’. / ‘Because with these discussions on water scouring by our father (which he had introduced appropriately to *Huysbou*) having been included in his *Eertclootstofroersel* and *Nieuwe manier van Stertebou door Spilsluysen* which he published himself shortly before he died, we should have been convinced of many circumstances that we would otherwise have undertaken to complete; thus we considered carefully whether to publish this eleventh book, in the same way as the previous tenth book, inasmuch as this is what we in our profession do’.

<sup>467</sup> I. Beeckman, ‘Journael’, fol. 206v.

<sup>468</sup> This probably explains why he listed the titles ‘6 Calis in ’t groot afgebeeld’ and ‘18 Santplate te Dansick’ as separate manuscripts instead of as parts of ‘Waterschuyringh’.

<sup>469</sup> Differences between Isaac Beeckman’s and Hendrick Stevin’s lists of contents as regards the titles to do with hydraulic engineering suggest that the structure of these texts was unclear and that each individually devised headings for them in the hope of imposing at least some order. This lack of coherence may have arisen from the fact that Stevin himself had already taken extracts from them for publication in ‘Eertclootschrift’ and ‘Nieuwe Maniere van Stertebou door Spilsluysen’.

ground plans.<sup>470</sup> In fact he supplemented the chapter on ‘Stedenoirdening’ with two texts by his father which were probably not intended for *Huysbou*. These were ‘Voorslach hoemen de gracht der schans te Berck bequamelick soude meugen diep houden sonder versanden oock sonder beeren te leggen’ and ‘Voorslach hoemen de watermolen soude meugen leggen binnen de Stadt Lingen, tegen t’middel van een wal, blijvende nochtans het water des grachts in sijn behoorlicke hoochde, en dat sonder beerden of dodanen’. Hendrick Stevin had found both texts among his father’s proposals for Danzig, Calais, Elbing and other cities, which according to the synopsis he also planned to include in the seventeenth chapter of *Huysbou* in *Materiae Politicae*. In the end these subjects were discussed in *Wisconstich Filosofisch Bedryf*.

Clearly, Hendrick Stevin was not aiming to produce a faithful reconstruction of the treatises on architecture and the art of warfare, but rather to present the contents in a way that did justice to his father’s intentions. He did not hesitate to add passages where he thought this was required. Since his father had already published sections of his unfinished essays in other works Hendrick Stevin felt no compunction in adding texts not originally intended for these works, explaining:

‘[...] that we could well have included [somewhere] a number of observations that were not written for such a specific purpose, some being considered to be of rather less consequence, others having apparently been left untouched by the writer for some time and having been given some other form before his death’.<sup>471</sup>

An interesting example of his attempt both to summarise and complete *Huysbou* is found in the thirteenth chapter of ‘Byvough’, entitled ‘Inhoudende ghedachtenissen opt model vant huys’. The long introduction reveals that he had compiled a three-dimensional version of a model made by his father and kept in the library of the court in The Hague, based on a plan and an elevation

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<sup>470</sup> See Appendix E, p. 490; The Hague, KB ms. 128-A-9-II, fol. 1v (translated): ‘Although the layout of cities is not part of this *Chrijchconst*, but rather part of architecture, this does not appear to be its proper place. Yet given that this was the particular concern of my father, regarding the ordering and fortification of cities and bastions, that in as much as the circumstances of the site allows, large and small towns and bastions should be situated in their location according to such rules as these, being properly laid out as a right-angled square, and furthermore very much against the general opinions of contemporary defence builders, which (since I have not been able to find my father’s complete description of this subject) I have illustrated in the final part of the present *Stedenoirdening* with a number of forms’.

<sup>471</sup> H. Stevin, *Materiae Politicae* unnumbered [p. 4]: ‘An den leser’: ‘dattet wel wesen conde, dat wij erghens eenige antyckeninghen inghevough hadden, die juyst tot sulck eynde niet gheschreven en waren, daer af sommighen van geringher achten cleyn gevolch mogen schijnen, ander ooghenschijnlick al een ruymen tijt by den Schrijver stil geleghen en voor sijn overlijden al een ander form vereyscht hebben’.

drawing.<sup>472</sup> Just as he employed drawings in *Huysbou* for this version of the model, so Hendrick Stevin's brief accompanying text probably drew freely on various chapters from the treatise. It is hardly surprising, therefore, that major discrepancies can be found with other tables of contents of *Huysbou*.

In 't Onderscheyt vande oirdeningh der steden' and 'Byvough der Stedenoordeningh, vande Oirdeningh der Deelen eens Huys met 't gheen daer ancleeft' in *Materiae Politicae* Hendrick Stevin included titles and subtitles from his general overview of *Huysbou*, although differing significantly in composition and sequence. He often added separate notes headed 'HS' discussing these differences between the published excerpts from *Huysbou* and the chapters listed in the general overview of the treatise. To ensure that the text ran smoothly and to avoid 'any extreme disruption of the order', these notes were kept as brief as possible.<sup>473</sup> The excerpts themselves contained references to *Huysbou*. These notes and references, in addition to the various lists of contents, provide further clues for the reconstruction of the original treatise on architecture.<sup>474</sup>

#### *The selection by Bosscha and De Waard*

The discovery of Beeckman's 'Journael' revived interest in Stevin's unfinished works. For Cornelis de Waard the presence of supposedly lost texts by Stevin, together with those by Descartes, formed a crucial argument in persuading the Hollandse Maatschappij der Wetenschappen to publish the manuscript in its entirety. J. Bosscha, secretary of the society, proved especially responsive to this argument, becoming personally involved in the reconstruction of Stevin's work. But although he mentioned *Huysbou*, he was mainly interested in Stevin's unfinished works on the art of warfare; and when it transpired that many of Stevin's texts had already been published posthumously by his son, Bosscha's enthusiasm for an expensive, integral edition soon cooled and he left the rest of the work to De Waard.

De Waard's principal aim was to publish Beeckman's 'Journael', not Stevin's unfinished work, so that in his reconstruction he did not venture beyond what

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<sup>472</sup> See Appendix E, p. 496; H. Stevin, 'Byvouch', p. 115-116. Thus Hendrick Stevin prefaces the chapter with the following remarks: 'Met dit model wort verstaen een van de Modellen na de voorschreve regelen der huysoordening gemaect, en jegenwoordich berustende op de bibliotheek van Syn Hoogheyt: Welcker een ick verschaeut heb als dese bygaende form; Doch na de grontteyckening en stantteyckening des voorgaende 4 Hooftsticx daermede genouchsaem overeencommende, hebbende noch tot behulp seker teyckening int rou van haere model genomen'. See also Van den Heuvel, 'Stevin et Ramus'.

<sup>473</sup> H. Stevin, *Materiae Politicae* unnumbered [p. 4]: 'An den leser': 'een te overvloedighe breking des oirdens'.

<sup>474</sup> See Appendix E.

he considered absolutely essential. He established that Hendrick Stevin's lists of contents differed substantially from Beeckman's, preferring the latter – arguing that since Stevin's son had employed different arrangements in his handwritten and printed extracts he saw no reason to follow him.<sup>475</sup> Moreover, De Waard transferred several statements in the *Huysbou* excerpts that he attributed to Beeckman to other passages in the 'Journael'.

While De Waard's preference for Beeckman's less complete, but more reliable arrangement may be broadly justified, he failed to give sufficient credit to the attempts by Stevin's son to convey the author's original intentions in his additional texts. Thus De Waard acknowledged the link Stevin himself had made between water scouring and architecture, but believed nonetheless that the author regarded them as two separate subjects. He based this on the premise that Beeckman had copied *Huysbou* on his first visit and had left 'Van de waterschuyring' for his second. This is unconvincing, however, since Beeckman copied parts of *Huysbou* on subsequent stays at Hazerswoude, as well as on his first visit.

On reflection De Waard's rejection of Hendrick Stevin appears exaggerated. Like Bosscha, De Waard based his choice of texts for inclusion in his edition of Beeckman's 'Journael' on whether the material was known. Bosscha was swayed primarily by the question of cost, whereas De Waard, who defended his selection on the basis of content, may have been influenced by considerations of time and size. In the end, his assortment of unknown passages from *Huysbou* resulted in a selection rather than a reconstruction of Stevin's treatise.

#### *Taverne's Architecturae Domesticae Stevini Synopsis*

The title of Ed Taverne's reconstruction derives from a note written by Isaac Beeckman in the margin of his table of contents of Stevin's architectural treatise. Whereas Beeckman only drew up a list of titles and copied what he considered to be the most interesting passages, Taverne compiled a comprehensive synopsis. This was the first provisional survey of the treatise to take into account all the known handwritten and printed sources. Citing references to *Huysbou* at numerous places in these various excerpts, Taverne identified three separate works, all interrelated but nonetheless different in content, tone and form: 'Vande oirdening der steden', 'Byvough der Stedenoirdening: vande oirdening der deelen eens Huys, met 'tgeene daer ancleeft' and 'Huysbouw'. Taverne concluded that to an extent all the texts fitted together and might

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<sup>475</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. II, 'avertissement au second volume', p. III.



therefore have been taken from a single treatise; but they also overlapped, thus strengthening the impression that there was more than one treatise. Prefacing the actual reconstruction and summary of the contents of the chapters of the various groups of texts with this provisional conclusion, Taverne set out the complexity of the problem. However, this clarity did not extend to the identity of the author of the various components and in particular of 'Byvough'.<sup>476</sup> While Taverne noted that around 1604-1605 Simon Stevin had planned to publish a treatise on architecture consisting of the three separate parts; he also mentioned the possibility that 'Byvough der Stedenoirdeningh' had been conceived much later, by Stevin's son. This confusion is understandable. The only possible conclusion from Hendrick Stevin's explanation in 'Cortbegryp' is that he himself was the author.<sup>477</sup>

At first sight, however, the annotation system suggests that the idea for 'Stedenoirdeningh' with an appendix was Simon Stevin's. Since Hendrick Stevin indicated in separate notes where he had deviated from the *Huysbou* sequence and which parts he had added, it seems plausible that the remaining sections of text were the original work of his father. And since these sections contain references to *Huysbou*, it might at first sight be assumed that Simon Stevin himself regarded his essays on town planning and 'Byvough' on dwellings more or less as separate works alongside *Huysbou*.

Yet the accuracy of Hendrick Stevin's annotations is not reliable and should be treated with as much caution as his remark that he added the appendix himself. Comparing his annotations, indicated with the initials 'HS', with the references to *Huysbou* in the body of the text, it is noticeable that the former consist mainly of explanatory notes on changes to the order of the chapters, while the latter tend to announce passages to be worked out in more detail in *Huysbou*. Given this distinction, it is possible to develop another hypothesis about the origins of the various texts.

Assuming that besides Simon Stevin, his son Hendrick also planned at some future time to publish the complete treatise on architecture (in addition to the

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<sup>476</sup> This is illustrated by the comments in Taverne, 'Architecturae domesticae Stevini synopsis', p. 444: 'Assuming that Hendrick Stevin was not himself the originator of an autonomous treatise on 'Byvough' – this possibility cannot be entirely excluded – it can be said that he followed his father's intentions', and on p. 445 'After all Simon Stevin – or was it solely his son Hendrick's idea? – wanted to add to the treatise on the planning and layout of towns a practical, illustrated guide to building a house for patron and craftsman, in which the main themes of the *Huysbou* almost all recur in abridged form'.

<sup>477</sup> H. Stevin, *Materiae Politicae*, p. 40: '[...] So at that point I shall form this appendix as attachment to Steden, although, as I say, only with regard to the layout [...] the actual work of construction and other circumstances are fully described in *Huysbou* (Architectura)'.

excerpts previously published),<sup>478</sup> it may not have been Simon Stevin but his son who decided to add 'Byvough' to 'Stedenoirdeningh' and to include these in *Materiae Politicae*.<sup>479</sup> This 'Byvough' was based on texts already written by Stevin for the chapter 'Vande oirdeningh der deelen een Huys', to which his son added parts from other original chapters along with some sections written by himself. Hendrick Stevin indicated significant differences from *Huysbou* in separate notes, and where he thought his father's text excessively detailed he simply stated that the rest would be dealt with at length in the forthcoming edition of *Huysbou*.<sup>480</sup> In short, all references in *Materiae Politicae* to *Huysbou* as a separate treatise, including those not in separate notes, were by Hendrick. Accordingly, the idea of a division into three parts was not Simon Stevin's, who had remained faithful to the concept of a single, comprehensive *Huysbou*, but his son's. Like his father, Hendrick Stevin failed to publish *Huysbou* as an integral edition. Nonetheless, several sections which he omitted in *Materiae Politicae* because they dealt with the practice of architecture were later included in *Wisconstich Filosofisch Bedryf*.

It seems, therefore, that the division into three parts – 'Van de oirdeningh der steden', 'Byvough der Stedenoirdeningh: vande oirdening der deelen eens Huys, met 'tgeene daer ancleeft' and 'Huysbou' – was never intended by Simon Stevin. So rather than follow Taverne's division of the various chapters into three groups, the present reconstruction attempts to recreate Stevin's treatise in a way that explains the overlaps between the chapters in the various handwritten and printed excerpts and the presence of texts which were never intended for it but were added by Stevin's son either for his own research purposes or because he saw them as being in the spirit of his father.

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<sup>478</sup> That Hendrick too intended to reissue the *Huysbou* and that such comments are not just copies of his father's texts is evident from Hendrick's observation in a note marked 'HS', Appendix E, p. 492, *Materiae Politicae*, '1 Onderscheyt van de Oirdeningh der Steden', p. 25 (i.e., p. 17, end of chapter 3): 'daervan de rest metter uytgaen der selver huysbou sal volgen'.

<sup>479</sup> That Hendrick also took 'Stedenoirdeningh' from the *Huysbou* is apparent in Appendix E, p. 492; *Materiae Politicae*, '1 Onderscheyt van de Oirdeningh der Steden', p. 11: 'soo sal ick hier eerst als [...] der Huysbou (daer deser Stedenoirdening oock uytgetrocken is) in vougen'.

<sup>480</sup> The fact that certain references to chapters in the printed version of 'vande oirdeningh der steden' are missing in the manuscript KB. 128-A-9-11 is an indication that these were added by Hendrick and not by Simon Stevin. See, for example, Appendix E, p. 492, *Materiae Politicae*, '1 Onderscheyt van de Oirdeningh der Steden', pp. 26-27, (i.e., pp. 18-19): 'Welcke verdeeling oock gedaen can worden na de manier die int volghende 5 Hooftstick verclaert sal worden'.

# 10. The reconstruction of Huysbou

## *Huysbou*

### 1 Vande lycksydicheyt des gebous

- 1 Van de bepalinge ende beschryvinge der lycksydicheyt
- 2 Vande lycksydige ordeningh der Romeynsche burgerlicke huysen en gemeene gestichts
- 3 Van de lycksydige ordeningh der Grieksche burgerlicke huysen

The general synopses of *Huysbou* compiled by Isaac Beeckman and Hendrick Stevin, and the reconstructions by Cornelis de Waard and Ed Taverne employed the same sequence for the first chapter. However, in his comments on the passages from *Huysbou* in *Materiae Politicae* Hendrick Stevin presented a different view. Here he added ‘Van de bepalinge ende beschryvinge der lycksydicheyt’ to the third chapter of ‘Vande oirdeningh der steden’, and joined the two other sections to form the first chapter of ‘Byvough der Stedenoirdeningh’. He provided the following explanation in ‘Cort Begryp’:

Thus far concerning the means required to make a large, powerful city, as well as the best way to judge the selection of a site, and since the word like-sidedness will occasionally occur below, I shall include as this third chapter by incorporating the third section from the second chapter of *Huysbou* (from which ‘Stedenoirdening’ is also taken) being sufficient to explain that which the writer purports to convey below.<sup>481</sup>

The statement that the passage is derived from the third section of the second chapter does not correspond with any of the tables of contents of

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<sup>481</sup> Appendix E, p. 492; H. Stevin, ‘Onderscheyt van de Oirdeningh der Steden’, p. 11: ‘Tot hertoe geseyt wesende van de middelen daermen groote machtige Steden deur maken can, oock vande verkiesingh der plaets daermense ten besten oirboir leggen moet, ende dat int volghende somtijds ’t woort Lijckzijdicheyt, te pas sal commen, soo sal ick hier eerst als 3 Hoofstick soo veel des 3 lidts vant 2 hoofstich der Huysbou (daer deser Stedenoirdening oock uytgetrocken is) in voug, als ghenoech schijnt om te kennen te gheven wat den Schrijver int hier na daer me verstaen wil hebben’.

*Huysbou*, including that compiled by Hendrick Stevin himself. Nor is there any indication that another chapter ever preceded the discussion of symmetry. Moreover, he concluded his definition and explanation of the concept of mirror symmetry by remarking that,

This [i.e. the material just discussed is a lengthy passage about mirror symmetry] is what I have tried to explain regarding the aforementioned first chapter on architecture in the ordering of cities (to understand what the writer means by the word like-sidedness) since the rest will be explained with the publication of *Huysbou*.<sup>482</sup>

This contradiction supports the notion that Hendrick Stevin did not intend to produce his own new arrangement of *Huysbou*, but rather to publish the work along with ‘Vande oirdeningh der steden’ and ‘Byvough’. His comments also show that he had omitted the passages about mirror symmetry, intending to elaborate on the subject in *Huysbou*. These passages probably included the two other sections of this first chapter. Thus he introduced the chapter ‘Lijcksijdige oirdeningh der Romeynsche en Griecsche Burgherlicke Huysen’ by stating,

This chapter should be seen as following the previous third chapter of ‘Stedenoirdening’ [i.e. ‘Vande bepalingh en beschrijvingh der Lycksydigheyt’] and although I stated I would discuss that in *Huysbou* I now feel that it would be more appropriate (it being an essential aspect of the ordering of houses) to include it here.<sup>483</sup>

He probably also left out other parts with the intention of incorporating these in *Huysbou*.

Isaac Beeckman noted the following passage, which De Waard assumed belonged to the chapter on mirror symmetry:

The building must be like an animal or a bird, fish or crawling creature or other, in which one sees that the right side is the same as the left, but the front is not the same as the back. Neither is it therefore necessary in architecture to make the back the same as the front.<sup>484</sup>

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<sup>482</sup> Appendix E, p. 492; H. Stevin, ‘Onderscheyt van de Oirdeningh der Steden’, p. 25, (i.e., p. 17): ‘Dit is ’t geene [i.e., the material just discussed is a lengthy passage about *lycksydigheyt*] over ick hier uyt het gemelte eerste Hoofstick der huysbou in der Stedenoirdening heb willen brengen (om den gront des woorts Lycksijdicheyt na de meyning des Schrijvers te verstaen) daer van den rest mettet uytgaen der selver huysbou sal volgen’.

<sup>483</sup> Appendix E, p. 493; H. Stevin, ‘Byvough’, p. 41: ‘Dit Hoofstick moet ghenomen worden als oft vervolghde opt voorgaende 3 Hoofstick der Stedenoirdening [red. Vande bepalingh en beschrijvingh der Lycksydigheyt]. En hoewel ick daer gheseydt heb dat te sullen volghen in den Huysbou, soo dunckt my nochtans nu ’t selve ghevoughelicker (als totte huysoideningh noodich diendende overdacht) hier te sullen worden ghebracht’.

<sup>484</sup> Appendix A, p. 447; I. Beeckman, ‘Journael’, fol. 231r lines 36-231v line 3. De Waard did not transcribe the passage because he thought it belonged to the discussion of mirror symmetry as

However, it is possible that this passage belonged to ‘Van de vervoeging der lichtplaetsen eens huys’ in which this parallel in nature is cited to justify differences in the layout of the front and rear of a house.

Finally, the following sentence from the description of Greek architecture reveals that a print was omitted:

The aforementioned buildings, have been engraved on copper and are currently available in print in large numbers with descriptions of the appearance of the construction and the animal-like like-sidedness that can be observed in them, however, circumstances having forced me to omit this.<sup>485</sup>

This decision had probably already been made by Simon Stevin, rather than by his son.

## II Van de onderaertsche werken

- 1 Van de grondtvastigh
- 2 Van de bornputten, pompen, santboringh  
[Van des schrijvers vont om diep onder water te booren]
- 3 Van de regenbacken
- 4 Van de heymelicken
- 5 Van de kelders

Isaac Beeckman’s arrangement of this chapter was identical to Hendrick Stevin’s, except that the latter inserted ‘Lidt van des schrijvers vont om diep onder water te booren’ between the former’s subheadings 2 and 3. This passage was probably originally written by Simon Stevin for a patent application concerning an underwater bore that his son thought would fit in well with the second section on ‘bornputten, boring en pompen’. Although in the original *Huysbou* the invention did not have a separate heading, Huygens’s copies suggest that it was discussed in connection with *bornputten*.<sup>486</sup>

In ‘Byvough’, Hendrick Stevin did not mention the first section on *grondtvastigh* in his introduction to the ninth chapter on the ‘ondereertsche wercken als Bornputten, Regenbacken, heymelicken en kelders’. He may have felt that

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given in *Materiae Politicae*. Other passages in Beeckman’s handwriting on mirror symmetry are fol. 229v lines 23-26 and fol. 230r lines 1-12.

<sup>485</sup> S. Stevin, *Huysbou*, [1-3], p. 227. Cf. H. Stevin, ‘Byvough’, p. 50.

<sup>486</sup> See also, Appendix A, p. 444; I. Beeckman, ‘Journael’, fol. 230r lines 21-27: ‘De vont vant booren in de grondt bestaet voornaemtlyck daerin’. For the other texts on ‘bornputten, santboringh en pompen’, see fol. 230r lines 13-15 and 230v lines 19-20.

this passage had little to do with the layout of a house. However, the synopsis indicates that the discussion of facilities below ground level was preceded by a section on reinforcing soil. This may have included passages which Stevin had originally intended in their entirety for *Huysbou* but which he subsequently published in part in 'Eertclootschrift'. Although Hendrick Stevin did not elaborate on the subject of *grondvastingh* in 'Byvough', some passages in Beeckman's 'Journael' appear to relate to this section.<sup>487</sup> In addition, Beeckman included various excerpts from Stevin's descriptions of *regenbacken*, *heymelicken* and *kelders*.<sup>488</sup>

### III Van de gevels

- 1 Van de freyten der gevels
- 2 Van de deuren en veynsters, die in de gevels commen
  - van de stof der cassynen van deuren en veinsters met die der luycken
  - vande verscheyden manieren vant open en toegaen der luycken
  - vant sluyten der veinsters
  - vande kijckveinsters
- 3 Van de waterlysten
- 4 Vant cieraet der gevels
  - [Vant gebruyck der pilaren tot gerief]
  - het geschil op de dichte en swaerte van pilaren (?)
  - [Vant gebruyck der pilaren tot cieraet]
- 5 Vande looven der gevels (?)
- 6 Vande gevels van hout met steen gemengt (?)

In 'Byvough', Hendrick Stevin followed the section on works below ground with a chapter on roofs. But not only was this sequence illogical, it also contradicted his other lists of contents, giving the next chapter as the section on façades. Beeckman followed the passages on *onderaertsche werken* with the first section on elevations, 'Van de freyten der gevels'. In the general synopses of *Huysbou* the first four sections of this chapter are all alike. Both 'Byvough' and Beeckman's manuscript contain references to this chapter.<sup>489</sup>

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<sup>487</sup> Appendix A, p. 438; I. Beeckman, 'Journael', fol. 225r lines 40-41: 'welsandt' and fol. 229v lines 16-22: 'Sandt onder water is vaste gront'.

<sup>488</sup> Appendix A, p. 446; I. Beeckman, 'Journael', fol. 230v line 21 and fol. 231r line 3.

<sup>489</sup> See for example, Appendix A, p. 437 and p. 446; I. Beeckman, 'Journael', fol. 225r lines 1-39 and fol. 231r lines 4-5, 8-32.

However, Hendrick Stevin added two sections, namely ‘Vande looven der gevels’ (5) and ‘Vande gevels van hout met steen gemengt’ (6). The actual texts have been lost, although passages elsewhere in Hendrick Stevin’s published editions correspond in content and may originally have belonged to this group. Thus he discussed galleries before mentioning façades in ‘Van de oirdeningh der steden’ and dealt with courtyard galleries in the discussion of ‘het gebruyck der pilaren tot gerief’, probably initially part of ‘cieraet der gevels’. ‘Gebruyck der pilaren tot gerief’ may also have included the third discussion point in Hendrick Stevin’s twelfth chapter on the thickness and strengths of pillars. In fact he did not present a complete discussion of the functional use of columns, explaining that the full text would appear in *Huysbou*. Having initially omitted this passage, perhaps considering it overly technical, he later attached it to the section on aesthetics as a separate discussion. Parts of ‘Vande gevels’, which he treated as separate passages, were probably also known to Beeckman, since the latter’s copies include texts dealing with various aspects of this topic. Beeckman probably did not list them separately since he thought they belonged to other sections. ‘Van de gevels van hout en steen gemengt’ relates primarily to constructional aspects of façades, so Beeckman may have thought it belonging to ‘freyten der gevels’.<sup>490</sup> The combination of wood and stone is also discussed in ‘Van de stof der cassynen van deuren en veinsters’. Finally, Beeckman may have considered that some aspects of this chapter belonged to ‘Verscheyden Anteyckingen’, dealing with the use of building materials.<sup>491</sup> However, Beeckman followed ‘cieraet der gevels’ immediately with passages on the use of wood. This might indicate that Hendrick Stevin’s sequence was not entirely incorrect. Unfortunately, no other clues exist to identify their position conclusively.

#### iv Van de steygers

- 1 Van de bequamheden ende onbequamheden dieder in stoff van steygers dient bedocht te worden
- 2 Van de bequamheden ende onbequamheden der wentelsteygers
- 3 Van de steeksteygers
- 4 Inhoudende voorbeelden van gemeyngde steygers na bedwongen plaets

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<sup>490</sup> One indication of this is the passage in Appendix A, p. 438; Beeckman’s manuscript at fol. 225r lines 29-40: ‘Steen gevels ofte haere freyten moeten door een gemeynen regel onder swaerst syn; daerom deughen de uytstekende triglyphi niet [...] Doch in houtwerck ist goet [...]’.

<sup>491</sup> See, for example, Appendix A, p. 442; I. Beeckman, ‘Journael’, fol. 227v lines 22-28: ‘Dewyle de steen is buyten ende het hout binnen, soo is de hechtinghe van beyden noodich [...]’.

- 5 Van eenighe telkonstighe rekeningen, die in de stof van oirdening der steegers kunnen te pas comen

Isaac Beekman's list of contents for this chapter corresponds with Hendrick Stevin's. The texts intended for this discussion of various types of stairs are largely unknown. In his copy, Beekman made a few remarks on the relation between the height and width of straight and spiral staircases, while Hendrick Stevin confined his comments on the model house to the remark that the head of the household should have his own stairs.<sup>492</sup> The few surviving fragments show that Stevin himself preferred straight flights of stairs.<sup>493</sup>

#### v Van de solders en overwelfsels

- 1 Van houtse solders
- 2 Van gepleysterde solders
  - Van de maniers des gebouws om versekert te zijn tegen brandt
- 3 Van de steene overwelfsels
  - 1 Lidt van de eygenschappen en voordeelen der steene overwelfsels en de beschrijving van haar vervouging tot decksels der camers
  - 2 Lidt van vier gemeenre regels op bogen en overwelfsels
  - 3 Lidt van eenige aenteyckeningen op bogen en overwelfsels

Although Isaac Beekman and Hendrick Stevin's lists of contents for the sections on the vaulting and roofing of rooms and houses correspond, the sequences differ. Moreover, while the former treated the various passages as parts of a single chapter, the latter divided them into a series of chapters. Comparing their lists of contents with the surviving sections of text, Hendrick Stevin's sequence appears more logical than Beekman's. This also applies to some extent to the division into separate chapters. After all, a chapter entitled 'Vande solders en overwelfsels' would not be expected to include a discussion of roofs. Furthermore, the title suggests that the ceiling is discussed first and then the vaulting – the order followed by Hendrick Stevin. In fact this sequence provided an opportunity to start with the drawbacks of wood as a building material before moving on to the safer plaster ceilings and stone vaults. The advantages of these materials probably explain Hendrick Stevin's insertion of the chapter 'Vande manier des gebouws om versekert te zijn

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<sup>492</sup> Appendix A, p. 439; I. Beekman, 'Journael', fol., 225v lines 18-24. Appendix E, p. 494; H. Stevin, 'Byvough': gedachtenissen opt Model van het Huys.

<sup>493</sup> S. Stevin, *Huysbou*, [VII-3], p. 327. Cf. H. Stevin, 'Byvough', pp. 62-63.



tegen brandt' where Beeckman included 'Vande gepleysterde solders'. A closer examination of the passages on fire safety reveals that Simon Stevin followed the general observations by recommending a thick plastering of the ceilings and a series of further steps to contain fires. Perhaps he realised, while setting out the advantages of plastered ceilings, that it might be interesting to explore fire safety in relation to other parts of the house too. But since the position of the passage in the chapter offered little scope for this, he did not elaborate the point. Beeckman called this section 'gepleysterde solders', reflecting the opening passage on plastering ceilings; Hendrick Stevin preferred to emphasise the fire safety aspect in his title. This also accorded with the central importance he gave in *Materiae Politicae* to the organisational side of his father's architecture and town planning. His 'Van de steenen overwelfsels' was probably not originally a separate chapter. This seems all the more likely given Beeckman's use of the title 'Van solders en overwelfsels' and the conclusion of the texts on the safety of plaster ceilings with a brief remark about stone vaulting which appears to introduce the next section. Apart from passages on the safety of certain types of ceilings and vaultings, Hendrick Stevin did not mention any other texts from this chapter in 'Byvough'. Beeckman's copies, on the other hand, contain various remarks on the subject.<sup>494</sup>

#### VI Van de daken

- 1 [stof der daken]
- 2 [form van daken]
- 3 het geschil van borstweeren daer daken op rusten

The discussion on roofs corresponds with the fourth and last section of the fifth chapter in Isaac Beeckman's list of contents. Hendrick Stevin's treatment of these texts on roofs as a separate chapter seems more plausible, since roofs are not mentioned in the heading 'Van de solders en overwelfsels' and these texts were probably quite long; at least that is the impression created by his comment on this chapter.

Thus far the focus has been on the matter of the roof, with regard to the shape, there are four groups [...] providing extensive explanations of the advantages and disadvantages and other circumstances of each with diagrams; yet since it is not the intention in this account of housebuilding to discuss everything in such detail, we will omit

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<sup>494</sup> Appendix A, p. 443 and 448; I. Beeckman, 'Journael', fol. 228 lines 1-10 and fol. 231v lines 17-18 and 232r lines 1-32.

it here, suffice it to state that the latter, namely the funnel roof, is the one preferred by the author.<sup>495</sup>

Beeckman, however, did list some of the advantages and drawbacks of different types of roof in his transcript.<sup>496</sup>

vii Van de oirdeningh der deelen eens huys als der camers lichplaetsen, galderyen, hoven blocken ende ten laesten der deelen welcke een camer heeft

- 1 Van de verwoeginge der lichtplaetsen eens huys  
[Vande looven der lichtplaetsen]
- 2 Van de verwoeginge der lichtplaetsen eens blocks burgerlicke huysen
- 3 Van de verwoegingh der camers of percken, die samen het huys maken
- 4 Van de verkiesinge der camers of percken, elck tot haer gebruyck met insicht door welcke dat men bequamelick gaen mach of behoort te gaen om tot de andere te comen en welcke niet
  - Vant open en toegaen der deuren, mitsgaders ghedachtenissen op sloten en sleutels  
[Ghedachtenissen op sloten en sleutels]
- 5 Van de verwoegingh der stucken, die in camers of percken vereyscht zijn, als steegers, portalen, schoorsteenen, schryfkasten, heymelicken, fonteynen, brandinghplaetsen, regenpypen, leuven
  - steegers
  - portalen  
[Hoemen de carpetten ande deuren en stijlen sal hechten sonder nagelen om die te connen afdoen als men wil]
  - schoorsteenen  
[Van Schoorsteenen]
  - brandinghplaetsen  
[vande voordeelen en achterdeelen der stoven]  
[Voordeelen]  
[Achterdeelen]
  - schryfkasten
  - heymelicken
  - fonteynen
- 6 Van de verwoegingh der hooven

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<sup>495</sup> S. Stevin, *Huysbou*, [VI-2], p. 299. Cf. H. Stevin, 'Byvough', pp. 102-103.

<sup>496</sup> Appendix A, p. 449; I. Beeckman, 'Journael', for 'de stof der daken' fol. 232r, lines 33-39; for the 'form der daken' fol. 232v, lines 1-20.

- (with commentary on ‘regenpypen’ and ‘leuven’)  
- 7 Van de vervoegingh der gaelderyen  
(possibly part of ‘hooven met haer looven tot bevrijding’)

Hendrick Stevin based much of ‘Byvough’ on this ‘Van de oirdening der deelen eens huys’, adding elements from other chapters of *Huysbou* and from his own texts. For the reconstruction of this chapter only the general lists of contents by Isaac Beeckman and Hendrick Stevin are therefore of use.

Although the chapter numbers differ in the two synopses (6 and 9 respectively), the text was placed in the same position in both reconstructions, the different numbers being the result of Hendrick Stevin’s decision to treat various passages which Beeckman regarded as subsidiary sections of Chapter 5 as separate chapters. In addition, Hendrick Stevin’s list of the contents of this chapter contains three sections more than Beeckman’s while several sections have divergent titles and positions.

The first section, ‘Vande vervouging der lichtplaetsen’, is the same in both versions. The second section in Hendrick Stevin’s synopsis, ‘Vande looven der lichtplaetsen’, was not recorded by Beeckman. Possibly the latter regarded it as part of ‘Vande vervouging der lichtplaetsen’, whereas the former preferred to give the passage a separate heading. The discussion of cross-shaped galleries also follows on logically from the passage on the corridor connecting the front and rear of a house in ‘Vande vervouging der lichtplaetsen’. Beeckman gave his second section the title ‘Vande vervoeginge der lichtplaetsen een blocks burgerlicke huysen’.<sup>497</sup> Hendrick Stevin did not include this here, although Chapter 14 in his list of contents is called ‘Vande oirdening der Burgelicke huysen een Blockx’; this may well be the same text, and he may have thought it more suitable as a separate chapter in a different position.<sup>498</sup> As third and fourth sections Hendrick Stevin included ‘Vande vervouging der camers of percken en andere nootlicheden die samen ’t het huys maken’ and ‘Van de verkiesinge der camers of percken, elck tot haer gebruyck met insicht deur welcke percken datmen bequamelick gaen mach om tot d’ander te commen, deur welck niet’, although Beeckman reversed this order. Hendrick Stevin’s sequence appears more logical, focusing first on the whole house and then on the component parts. The opening remarks of ‘Vande vervouging der camers

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<sup>497</sup> This passage is illustrated by a drawing in Beeckman’s ‘Journael’ and is somewhat separate from the other parts of the chapter; it is found at fol. 231v lines 13-16.

<sup>498</sup> When one reads the text with the same title in Hendrick Stevin’s *Materiae Politicae* as part of ‘De Stedenoordening’, it is noticeable that it deals mainly with the position of the ‘lichtplaets’ or atrium in the various plans for combined ‘burgerlicke’ dwellings. This suggests that the text was originally part of the chapter ‘Vande oirdeningh der deelen eens huys etc’, as Beeckman indicates.

of percken en andere nootlichkeiten die samen 't het huys maken' also support this approach.

Before I come to the point, I first want to say that it is not my intention, that this layout will please everyone, or even the majority [...]<sup>499</sup>

These words are clearly introductory and smooth the transition from the discussion of the basic principle of the organisation of dwellings and residential blocks in the first two sections to a discourse on the general layout. Having explained the arrangement of the main elements of a house with drawings, Stevin continued with a chapter on the layout of rooms and of circulation in a house.<sup>500</sup> The discussion of locks relates directly to the chapter 'deur welcke percken datmen bequamelick gaen mach om tot d'ander te comen, deur welck niet'.<sup>501</sup> Here Stevin explained the proper use of keys, citing the example of a princely household and that of a wealthy gentleman. While conceding that a different arrangement might be required in a larger or smaller house, Stevin believed that the general principles were sufficiently explained.<sup>502</sup> And while he may have made notes for this, his son concluded this section by observing that he

[...] had intended to describe a princely house with all its assembly rooms.<sup>503</sup>

Hendrick Stevin included parts of this section in 'Van de form der steden' and again in *Materiae Politicae*, in 'Van der Radenoorden'. In this passage, which was probably originally intended for *Huysbou*, the author explained why he wished the princely house to accommodate not only the administrative bodies but also all the officials with their wives and children. His seven arguments for this were intended mainly to reduce the amount of movement or travel to achieve more effective government while also saving money.<sup>504</sup>

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<sup>499</sup> S. Stevin, *Huysbou*, [VII-3], p. 321. Cf. H. Stevin, 'Byvough', p. 60.

<sup>500</sup> S. Stevin, *Huysbou*, [VII-4], p. 337. Cf. H. Stevin, 'Byvough', p. 72.

<sup>501</sup> The excerpts in Beekman's manuscripts give no further clues as to the order of these passages from *Huysbou* since they are in completely different places: fol. 225v lines 28-226 r line 8 'Van de vervougingh der camers', fol. 231r 'Ghedachtenissen op sloten en sleutels' as part of 'deur welke percken datmen bequamelick gaen mach'.

<sup>502</sup> S. Stevin, *Huysbou*, [VII-4]. Cf. H. Stevin, 'Byvough', p. 71: 'Merckt noch dat hoewel meerder of minder Vorstelycke huysen, dat 't gheene hier tot voorbeelt ghenomen is, ander oirdeningh der gedeelten soude vereysschen dan dese; doch soo is myn meningh, van 't gheene daermen na behoort te trachten, daer mee ghenoech int ghemeen verclaert, te weten deurwelcke percken datmenbequamelick gaen mach om tot d'ander te comen, deur welke niet'.

<sup>503</sup> S. Stevin, *Huysbou*, [VII-4]. Cf. H. Stevin, 'Byvough', p. 72 on the fact that the discussion of 'vorstelicke huysen' is incomplete: 'van meyning was hier noch verhael te doen van een Vorstelick huys met al sijn vergaeringhen daer by'.

<sup>504</sup> H. Stevin, *Materiae Politicae*, 'Onderscheyt der Radenoorden', p. 57.

In sections 7 to 9 of his arrangement Hendrick Stevin dealt not with rooms as a whole but with parts of them. Section 10 in his list ‘Van de vervouging der hooven met haer looven tot bevrijding’ appears to be identical to the fifth section in Beeckman’s, possibly including part of the sixth section ‘Van de veruoegingh der gaelderyen’. The principal difference between the two arrangements of these final sections of the chapter being that Beeckman dealt with the whole house with all its rooms, grounds and annexes before turning to the details, while Hendrick Stevin reversed the order linking the text about various elements of rooms directly to the discussion of the layout and use of *camers* or *percken* as a whole, concluding with a discourse on *hooven* and *looven* as distinct units. Here again, his arrangement seems more logical since it opens with interior components before continuing with the outside of the house. ‘Vande veruoegingh der stucken, die in camers of percken vereyscht zijn’ should therefore follow ‘Van de verkiesinge der camers of percken, elck tot haer gebruyck met insicht deur welcke percken datmen bequamelick gaen mach om tot d’ander te commen, deur welck niet’.

As examples of elements in rooms Beeckman listed *steygers*, *portalen*, *schoorstenen*, *schryffkasten*, *beymelicken*, *fonteynen*, *brandinghplaetsen*, *regenpypen* and *leuven*. The final two appear out of place here and seem to belong to the two concluding sections on *hoven* and *loven*. However, the sections on *stoven*, *schoorstenen* and attaching ‘carpetten aande deuren en stijlen’ in Hendrick Stevin’s list of contents all correspond with Beeckman’s list of interior elements. Thus *stoven* match Beeckman’s *brandinghplaetsen*. The term *schoorstenen* (chimneys) appears to suggest indoor brickwork fireplaces, although the contents of the related excerpts from *Huysbou* indicate otherwise.<sup>505</sup> Stevin may originally have intended to make a few cursory observations on the best types of chimneys for indoors and outdoors, but the theoretical discussion of smoke dispersal entered such detail that it no longer fitted into the initial plan for the chapter. The excerpts on chimneys in ‘Byvough’ deal with smoke and different types of chimney stacks. Hendrick Stevin included the remaining passages about smoke dispersal in ‘Vande oirdening der deelen eens Huys’, while Beeckman incorporated these under ‘Verscheyden Anteyckeningen’. In fact it is possible that sections on smoke were found at both places in Stevin’s original manuscripts. The discussion of ‘carpetten aande deuren en stijlen’ is not immediately identifiable in Beeckman’s list, but this may have formed part of Stevin’s observations on *portalen*, a term also used to refer to doors and doorposts.<sup>506</sup> Finally, the com-

<sup>505</sup> On this see also the etymological discussion in the inaugural address given by R. Meischke, *De schoorsteen binnenshuis en op het dak: Address delivered on his appointment as extraordinary professor of the history of architecture at the University of Leiden on Friday 14 1986*, (Leiden 1986), pp 5-9.

<sup>506</sup> The word ‘portalen’ in the sense of doorposts is found in the writings of among others Pieter Coecke van Aelst and Charles de Beste.

ments on drainpipes and *leuven*, the concluding items in Beeckman's 'Vande vervoegingh der stucken, die in camers or percken vereyscht zijn', belong to the two ultimate sections of this chapter, 'Van de vervouging der hooven met haer looven tot bevrijding' and 'Van de vervoegingh der gaelderyen'. The content of these sections is otherwise largely unknown, but a discussion of the design of spaces outside houses nonetheless seems to form a logical transition from the layout of houses to that of towns.<sup>507</sup>

#### VIII Van de oirdeningh der steden

- 1 Van de middelen daer men groote en machtige steden door maken can
- 2 Van de verkiesingh der plaetsen, daer men de steden wilt leggen
- 3 Van de form der steden
  - Vande oirdening der kercken en Tuychthuysen
  - Van looven voor de Huijsen op beyden sijden der straten
  - Vande lycksydighe vergrooting der stadt
  - Verstercking der vierhoecken van kleinder tot Grooter
- 4 Vande Handel der Waterschuyring
  - Vande Waterschuyring int gemeen
  - Vande Schuyring met sluysen
  - Van de sluysen (Van de form der sluysen die mij best bevalt)
  - Van de havens
  - Van de hoofden
  - Lopende langs een stadt een rechte rivier; Die rontsom de Stadt te Leyden
  - De grachten int sant dieper gegraven worden deur santtrecking onder water dant in droge te graven deurt behulp van hosing (?)
  - Hoe men stilstaende stinckende grachten kan ververschen (?)
- 5 Hoe men omt verdrincken der steden te voorkomen, bedyckte landen hoger doet wassen die daerme oock vruchbaerder syn

The contents of first three sections of this chapter listed by Isaac Beeckman and Hendrick Stevin and in the manuscript 'Eenighe stucken der Crychconst Beschreven Deur Simon Stevin' all correspond. The printed edition of this chapter in *Materiae Politicae*, however, includes the first section of the first

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<sup>507</sup> It appears that both Beeckman and Hendrick put parts in other places. On the 'hooven' that were not to adjoin the street, see S. Stevin, *Huysbou*, [VII-2], p. 315. Cf. H. Stevin, 'Onderscheyt van de Oirdeningh der Steden', p. 24 and Isaac Beeckman, 'Journael', fol. 225v lines 25-27. Otherwise no other remarks on the 'galderyen' are known, even though they may correspond to the discussions of 'looven' on either side of the street or the 'looven' in the façades.

chapter of *Huysbou*, ‘Vande bepaling en beschrijving der Lijcksijdicheyt’, between ‘Verkiesinge der plaets daermen steden wil leggen’ and ‘Van de form der steden’, although as Hendrick Stevin acknowledged, it did not belong here. Beeckman and Hendrick Stevin’s lists of contents for the rest of the chapter differ considerably. Nonetheless, this can again be partly explained by the latter’s tendency to turn subsections into separate chapters, as in the case of ‘Vande oirdening der kercken en tuchthuysen’. This he listed as the tenth chapter of *Huysbou*, whereas Beeckman did not mention it separately, probably regarding it as part of ‘Van de oirdeningh der steden’ – in particular the description ‘Van de form der steden’, dealing with various public buildings and even including brief remarks on the accessibility of churches and the place of the *tuchthuys* in the town plan. This passage probably consisted of little more than a title, making it difficult to assign a position in the text. Similarly, Sections 4 and 5 in Hendrick Stevin’s list of contents, ‘Van looven voor op beyde zijden straten’ and ‘Vande lijckzijdige vergrooting der stadt’, were not separately listed by Beeckman.<sup>508</sup> Given that these also clearly referred to the design of the city, they probably represented part of ‘Van de form der steden’ in the original scheme.

Despite differences in the number and the titles of the sections, the passages following ‘Van de form der steden’ in both Beeckman and Hendrick Stevin’s lists of contents all relate to hydraulic engineering. The former lists ‘Van de sluysen’ (4), ‘Van de havens’ (5) and ‘Van de hoofden’ (6), whereas the latter lists no less than eight sections on the subject. It is evident from Stevin’s own statements that these sections were intended for *Huysbou*. While referring generally to his treatise on architecture when discussing locks and harbours in his *Nieuwe Maniere van Sterctebou door Spilsluysen*, he referred specifically in the second book of ‘Eertclootschrift’ to a more detailed treatment of piers in *Huysbou*.<sup>509</sup> He also mentioned a discussion of the removal of bars at the entrances to harbours, intended for *Huysbou*. To these sections his son added a separate chapter entitled ‘Waterschuyring’. A comparison of ‘het xi boek Vanden Handel der Waterschuyring onses vaders’ in *Wisconstich Filosofisch Bedryf* with the titles on hydraulic engineering listed by Beeckman as part of ‘Vande oirdeningh der steden’ reveals some marked similarities. Despite the difference in their treatment of ‘Waterschuyring’, both Hendrick Stevin and Isaac Beeckman listed sections dealing with hydraulic engineering at the same place

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<sup>508</sup> In Beeckman’s ‘Journael’ (see, Appendix A, below, p. 450) these texts also form part of a single group: fol. 232v lines 23–34.

<sup>509</sup> S. Stevin, *Wisconstighe Ghedachtenissen*, ‘Tweede Bouck des Eertclootschrift Vant Stofroersel des Eertcloots’, p. 65.

in ‘Vande oirdeningh der steden’, suggesting that Stevin originally intended to present this chapter as part of his discussion of town planning. Indeed, in the second book of ‘Eertclootschrift’ he specifically referred to *Huysbou* while discussing how to improve access to harbours by removing bars naturally.<sup>510</sup> The lack of a well-defined structure for this essay on ‘Waterschuyring’ is probably what caused Isaac Beeckman and Hendrick Stevin to divide the text and give their own titles to the various sections. ‘Vande Schuyring met sluysen’, ‘Van de sluysen (Van de form der sluysen die mij best bevalt)’, ‘Lopende langs een stadt een rechte rivier’, ‘Die rontsom de Stadt te Leyden’, ‘Van de havens’, ‘Van de hoofden’ and ‘De grachten int sant dieper gegraven worden deur santtrecking onder water dant in droge te graven deurt behulp van hosing’ are found both in ‘Waterschuyring’ in *Wisconstich Filosofisch Bedryf* and in the excerpts from this essay that Isaac Beeckman incorporated in his ‘Journael’.<sup>511</sup> As time passed, Simon Stevin himself probably lost sight of which passages in *Huysbou* and ‘Waterschuyring’ overlapped and which could be divided between the two proposed publications.

That Stevin had intended to incorporate a substantial passage on hydraulic engineering in his discussion of town planning is apparently confirmed by the inclusion in both Beeckman and Hendrick Stevin’s lists of contents of ‘Hoe men omt verdrincken der steden te voorkomen, bedyckte landen hoger doet wassen die daerme oock vruchbaerder syn’ as the final section. In his manuscript version of ‘Vande oirdeningh der steden’ Hendrick Stevin added an essay on ‘Hoe men stilstaende grachten kan ververschen’. In his list of contents for *Huysbou*, however, this follows directly after the passage on the expansion of the town. Canals did indeed play a major part in Simon Stevin’s views on urban expansion and he may have wished to discuss this here. Yet this topic does not relate as closely to the form of the town as it does to the discussion of water management. It therefore seems plausible that Stevin would have moved on to the topic of deepening and then the cleaning of canals only after the general introduction to ‘Waterschuyring’.

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<sup>510</sup> S. Stevin, *Wisconstighe Ghedachtenissen*, ‘Tweede Bouck des Eertclootschrift Vant Stofroersel des Eertcloots’, p. 67.

<sup>511</sup> At another place in his copy of works left by Stevin, Beeckman also copied out a passage from ‘Waterschuyring’. Titles from this correspond to the list of contents in the chapter ‘Vande oirdeningh der steden’. It is likely that Stevin worked on both texts at the same time, and that some passages were intended to occur in both. In Beeckman’s excerpts (see Appendix A, p. 451) the passages about locks come immediately after the discussion of ‘Vande lyckseydiche vergrooting der stad’, fol. 232v lines 35; fol. 233r line 2. Here too this is confirmation that these passages on hydraulic engineering belonged to the chapter ‘Vande oirdeningh der steden’.



Versheyden aenteyckeningen/ Versheyden aenteyckeningen van Metselrye,  
Van Timmeringh, Van Smedingh Van Roock

- Van Metselarye
- Van backsteen, hartsteen en tegelen
- Van calckmortel en trast
- Vant verbant der backsteen en hartsteen
- Van hooge sware metselrie
- Waerom nieuwe metselrie tegen oude gewrocht altijt bevonden wat te sincken en hoemen dat voorcommen can
- Van hechting van hout en steen
- Van Timmering
- Vande soorten van hout diemen in een landt gebruyckt als hier
- Vander timmerlien hupsche reetschappen die een seltsaem werck doen
- Vande vervouging der corbelen en van stooven
- Vant lassen der balcken
- Waerom het dack van de sael inden Haeg so lange duert
- Vande rusting der daken op de muerplaten en echting des selfs solders ande muerplaten
- Van Yserwerck en van smedingh
- Van Roock
- Van Schoorstenen, te weten om die te veroirdenen datse wel roock trecken.
  - [1. Punt vande Spieghelingh des roocz.]
  - [2. Punt. Vande versheyden middelen diemen tot elcke plaetsen ghebruyckt]

Unlike Hendrick Stevin, Isaac Beeckman did not regard the notes on bricklaying, carpentry and ironwork as a separate chapter but placed them in an appendix together with a fragment entitled ‘Van roock’.

Although he had studied the question of smoke dispersal for years, as the notes in his ‘Journael’ show, the passages from Stevin’s work that Beeckman included in ‘Versheyden aenteyckeningen’ are comparatively short. In ‘Byvough’, Hendrick Stevin included ‘Spieghelingh des roocz’ as part of a discourse on chimneys. Chimneys appeared again in the chapter on ‘Oirdeningh der deelen eens huis’ and were mentioned alongside *brandinghplaetsen* in ‘Vande vervoeingh der stucken die in camers of percken vereyscht zyn’. The title suggests a limited subject matter; if this contained a discussion on smoke, it must have been relatively brief, referring mainly to the shape of chimneys and fireplaces. General and theoretical reflections on the causes of smoke would have been out of place here and were probably included in ‘Versheyden aenteyckeningen’.

Hendrick Stevin included one other title in his ‘Tytels en Cortbegrypen’ not mentioned separately by Beeckman: ‘Vande hechting van hout en steen’. This probably also accompanied the general observations on *metselrie* and *timmering*. Fortunately, several of these observations – largely omitted in ‘Byvough’ – were preserved in Beeckman’s copies. They reveal a scientific interest in what Hendrick Stevin referred to as the *dadelick maeksel*, or actual making of architecture.

Aenteijckeninghen op Serlijns en anderen / Inhoudende sommige geschillen

- [1.] Geschil op maten der pilaren met haer aencleving
- [2.] Geschil opt gebruyck der pylaren tot cieraet
- [3.] Geschil op dicte en swaerte van pilaren
- [4.] Geschil op architraven
- [5.] Geschil op clocken
- [6.] Geschil op Acroteria of pedestalen
- [7.] Geschil op uytsteecksels der gevels
- [8.] Geschil op beeldich cieraet en nitsen
- [9.] Geschil op hoogte der camers na reden haerder langde en breedte

At first glance almost all these discussions, of which Isaac Beeckman did not compile a separate list, concern the classical orders and ornamentation. The only section not about façade decoration is the final passage on the proportions of the sides of a room.<sup>512</sup> In fact, compared to the rest of Stevin’s treatise, the subjects discussed here are the closest to those dealt with by the author’s forerunners and contemporaries. The discussions listed here may therefore correspond to Beeckman’s heading ‘Aenteijckeninghen op Serlyns en andere’, although Hendrick Stevin’s list of contents contains two discussions – ‘Geschil op de dicte en swaerte van pilaren’ (3) and ‘Geschil van borstweeren daer daken op rusten’ (9) – that concern structural rather than aesthetic aspects. ‘Geschil op de dicte en swaerte van pilaren’ probably belonged to ‘Het gebruyck van pilaren tot gerief’, but was considered too technical and therefore kept separate. It may have originated in another work on mechanics, placed temporarily by Stevin in ‘Verscheyden Anteyckeningen’ until a suitable location could be found. ‘Geschil van borstweeren daer daken op rusten’ was probably also intended for elsewhere in *Huysbou*. Beeckman’s copies reveal that Stevin explained in his chapter on roofs why he preferred these not to rest on

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<sup>512</sup> In Beeckman’s manuscript (see Appendix A, p. 443) this question is discussed separately at fol. 227v lines 31-35.

parapets.<sup>513</sup> It remains doubtful, however, whether Stevin intended to turn this into a separate chapter with its own heading.

### *Fragments indirectly related to Huysbou*

In addition to the passages identified as belonging to *Huysbou*, certain fragments not originally written for this work nevertheless shed light on it. First and foremost are the texts that Isaac Beeckman and Hendrick Stevin added to their excerpts but which were actually drawn from the author's other manuscripts. Another group includes texts, which were originally intended for *Huysbou* but were later incorporated in other treatises. Finally, some texts that were never intended for *Huysbou* nevertheless provide information about its structure and, more generally, its contents.

#### ISAAC BEECKMAN'S ADDITIONS

Beeckman's excerpts from Stevin's manuscripts include a long passage on 'Singconst'. Although it is not unusual to find a passage about music theory in an architectural treatise, and Stevin himself referred to the subject in his discussion of *lyckseydicheyt*, the table of contents of *Wisconstighe Ghedachtenissen* reveals that he had consistently intended to present 'Singconst' and *Huysbou* as two separate works. The inclusion of passages on music in Beeckman's 'Journael' probably only reflects the haphazard sequence in which excerpts from Stevin's manuscripts were copied on different days. The text on music follows the statement 'Uyt Stevijns papieren gheteijckent den 29en junij 1624' ('Copied from Stevin's papers on 29 June 1624'), which ends a passage from *Huysbou* and precedes new excerpts. The copyist may well have had enough of *Huysbou* and decided to continue with excerpts from other works, namely 'Singconst'. On the next visit, Beeckman may have decided to take a further selection from *Huysbou*. For Beeckman, there was no need to state that this passage on music did not come from the treatise on architecture; he knew that anyway and his 'Journael' was only for private use. De Waard also suspected that Beeckman had added some of his own views about architecture to those of Stevin and had placed them elsewhere in the transcript.<sup>514</sup>

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<sup>513</sup> Appendix A, p. 450; I. Beeckman, 'Journael', fol. 232v lines 10-13.

<sup>514</sup> De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. 297, note 1.: 'Cette note et les trois suivantes ne se trouvent pas B ce fol. 195 verso, mais plus loin, aux fol. 225 verso, 226 recto et 232 recto, parmi plusieurs passages que Beeckman a tirés du Huysbouw de Stevin. Nous avons reporté ces notes ici, puisqu'elles ne paraissent pas tirées du traité de Stevin, mais semblent reproduire des réflexions faites par Beeckman'.

While 'Byvough der Stedenoirdenigh, van de oirdeningh der deelen eens Huys met 't gheene daer ancleeft' in *Materiae Politicae* was a compilation of several chapters from *Huysbou*, Hendrick Stevin also added his own texts with his own illustrations. This is clear from his introduction to the thirteenth chapter in 'Byvough', 'Inhoudende ghedachtenissen opt model vant Huys'.

The model cited is one of the models made according to the aforementioned rules for the layout of houses, and currently kept at His Highness's library: which I have represented as this accompanying diagram, despite sufficient similarities to the ground plans and elevations of the previous four chapters, having used certain rough drawing of that model as an aid [...]<sup>515</sup>

Evidently, he had made a three-dimensional model based on the texts and a ground plan and elevation by his father (ills. 20 and 21) originally intended for *Huysbou*. To do this he used a rough sketch of the model in the library of Stadtholder Frederick Henry Just as the representation of the model was based on drawings in *Huysbou*, so Hendrick Stevin's short accompanying text seems to be freely adapted from several chapters of *Huysbou*. The texts, 'Vande Lijkseydichey', 'Vrijlicht', 'Dack', 'Looven', 'Steygers', 'Vande vasticheyt vant huys in syn geheel', were probably not by Simon Stevin, but short passages based on parts of *Huysbou*. As such they provide only indirect information for the reconstruction of the treatise.

Hendrick Stevin also mentioned a few other fragments in his general list of contents of *Huysbou* which, he admitted, did not really belong there. The seventeenth and final chapter, he noted,

Containing some of the writer's inventions for the improvement of cities, namely Danzig, Elbing, Braunsberg, Rheinberg, Deventer and Zutphen, Scheidam and Lingen to which has been added 'Weechdadelichen Handel van Cammen en Staven in Watermolens' and 'Cleytrecking'.<sup>516</sup>

Thus these final additions did not belong to *Huysbou*, which is probably true of most of the passages concerning Stevin's *vonden* (inventions), although

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<sup>515</sup> See Appendix E, p. 496: 'Met dit model wort verstaen een van de Modellen na de voorschreve regelen der huysoordening gemaect, en jegenwoordich berustende op de bibliotheek van Syn Hoogheyt: Welcker een ick verschaeut heb als dese bygaende form; Doch na de grontteyckening en stantteyckening des voorgaende 4 Hooftsticx daermede genouchsaem overeencommende, hebbende noch tot behulp seker teyckening int rou van haere model genome [...]'.

<sup>516</sup> See Appendix J, p. 512: 'Inhoudende sommige vonden des schrijvers tot verbetering ettelicker Steden, te weten Dantsick, Exbing, Breunsberg, Rijnberck, Deventer en Zutphen, Schiedam en Lingen waerby noch gevoucht is Weechdadelichen Handel van Cammen en Staven in Watermolens en cleytrecking'.

he may have intended to insert one or more of them in *Huysbou*, in ‘Vande oirdeningh der steden’. It is, moreover, noticeable that the passage, ‘Houdt is meer dan viermael sterker dan syn geklooven vierendeel’, which Beeckman included in his ‘Journael’ from the texts on ‘Cammen en staven, Watermolens en pompen, cleytrecking’, also occurs in a shorter version in the copies of *Huysbou*.<sup>517</sup> Yet these pieces were not mentioned in any of the lists of contents of *Huysbou*. Beeckman’s separate mention of these texts in his inventory of Stevin’s manuscripts suggests that they were meant as separate treatises.

#### STEVIN’S EARLY PUBLICATIONS OF PASSAGES INTENDED FOR HUYSBOU

Sections from other works that were added to *Huysbou* need not be considered here. However, some passages, known to have been intended for *Huysbou*, were incorporated partly or wholly in other publications. It is often unclear whether, having published a passage, Stevin planned to return to the question in *Huysbou* and, if so, whether this was to be in a shorter form or at greater length. While he never completed ‘Deursichtighe’, there is no evidence in the synopses or excerpts from *Huysbou* that Stevin intended to discuss perspective there. The missing section, ‘Wanschaeuwing’, bore little relation to the architecture treatise, while Stevin probably thought that other aspects had been dealt with at sufficient length. The various publications on water are an entirely different matter. Both the two published works, ‘Eertclootschrift’ and *Nieuwe Maniere van Sterctebou door Spilshuysen*, and the posthumous ‘Waterschuyring’ refer to *Huysbou*. Several of the titles in *Huysbou* relating to hydraulic engineering are also found in both *Nieuwe Maniere van Sterctebou door Spilshuysen* and ‘Waterschuyring’. It is impossible to know whether these were of the same material and length. It is equally unclear whether, after the publication of some sections from *Huysbou* in the former work, Stevin carefully divided the remaining texts between ‘Waterschuyring’ and *Huysbou* or whether he accepted that some texts would overlap. From the references to *Huysbou* in these works, it is possible to identify which subjects were to be covered, although the form in which they were to be presented remains unclear.

#### STEVIN’S TEXTS NOT INTENDED FOR HUYSBOU BUT WHICH THROW LIGHT ON ITS CONTENTS

Besides the passages intended for *Huysbou* published by Simon Stevin and later by his son, other unconnected publications but contain clues to the contents of *Huysbou*. Thus *Dialectike ofte Benyconst* (1585) and the later ‘Wysentijt’ (1605)

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<sup>517</sup> Cf. De Waard, *Journal tenu par Isaac Beeckman*, vol. II, p. XII and its Appendix I, p. 401.

provide interesting references to the structure of a scientific treatise. Where the lists of contents are incomplete or contradictory, these works provide key supplementary evidence explaining the logic behind the structure of Huysbou. In addition, other works on various subjects, such as *De Beghinselen der Weeghconst*, *Het Burgherlick Leven* and 'Radenoirden', contain analogies offering additional information about Stevin's ideas on architecture and town planning.

# II. Contents of Stevin's Huysbou

## *I Vande lycksydicheyt des gebous*

(On the like-sidedness of buildings)

- 1 Van de bepalinge ende beschryvinge der lycksydicheyt  
(On the definition and description of like-sidedness)
- 2 Vande lycksydige ordeningh der Romeynsche burgerlicke huysen en gemeene gestichts  
(Concerning the like-sided order of Roman private houses)
- 3 Van de lycksydige ordeningh der Grieksche burgerlicke huysen  
(The like-sided ordering of Greek Private Houses)

## *II Van de onderaertsche werken*

(On underground structures)

- 1 Van de grondtvestingh  
(On Foundations)
- 2 Van de bornputten, pompen, santboringh  
(On spring wells, pumps and drilling in sand)  
[Van des schrijvers vont om diep onder water te booren]  
[ [On the invention of the author to drill deep underground]]
- 3 Van de regenbacken  
(On cisterns)
- 4 Van de heymelicken  
(On privies)
- 5 Van de kelders  
(On cellars)

### *III Van de gevels*

(On façades)

- 1 Van de freyten der gevels  
(On buttresses in façades)
- 2 Van de deuren en veynsters, die in de gevels commen  
(On doors and windows in façades)  
van de stof der cassynen van deuren en veynsters met die der luycken  
(On the subject of frames for doors and windows and on shutters)  
vande verscheyden manieren vant open en toegaen der luycken  
(On different ways to open and close shutters)  
vant sluyten der veynsters  
(On closing windows)  
vande kijckveynsters  
(On oriel windows)
- 3 Van de waterlysten  
(On dripstones)
- 4 Vant cieraet der gevels  
(On the ornament of façades)  
[Vant gebruyck der pilaren tot gerief]  
( [The use of colomns for convenience] )  
het geschil op de dichte en swaerte van pilaren (?)  
(dispute about the thickness and weight of colomns (?))  
[Vant gebruyck der pilaren tot cieraet]  
( [The use of colomns for ornament] )
- 5 Vande looven der gevels (?)  
(On galleries in façades)
- 6 Vande gevels van hout met steen gemengt (?)  
(On façades of timber combined with stone)

### *IV Van de steygers*

(On stairs)

- 1 Van de bequagheden ende onbequagheden dieder in stoff van steygers dient bedocht te worden  
(On the advantages and disadvantages that should be taken into account regarding stairs)
- 2 Van de bequagheden ende onbequagheden der wentelsteygers  
(On the advantages and disadvantages of spiral staircases)
- 3 Van de steecksteygers



(On straight flight of steps)

- 4 Inhoudende voorbeelden van gemeyngde steegers na bedwongen plaets  
(Containing examples of stairs that are mixed due to limited space)
- 5 Van eenighe telkonstighe rekeningen, die in de stof van oirdening der steegers kunnen te pas comen  
(On some mathematical calculations that could be useful in the matter of designing staircases)

*V Van de solders en overwelfsels*

(On cielings and vaults)

- 1 Van houtse solders  
(On wooden ceilings)
- 2 Van gepleysterde solders  
(On plastered ceilings)  
Van de maniers des gebouws om versekert te zijn tegen brandt  
(On how to protect buildings against fire)
- 3 Van de steene overwelfsels  
(On stone vaults)
  - 1 Lidt van de eygenschappen en voordeelen der steene overwelfsels en de beschrijving van haar vervouging tot decksels der camers  
(Section on the properties and advantages of stone vaults and a description of their application as a covering for rooms)
  - 2 Lidt van vier gemeene regels op bogen en overwelfsels  
(section on four general rules for arches and vaults)
  - 3 Lidt van eenige aenteyckeningen op bogen en overwelfsels  
(Section containing notes on arches and vaults)

*VI Van de daken*

(On roofs)

- 1 [stof der daken]  
(Roofing materials)
- 2 [form van daken]  
(The shape of roofs)
- 3 het geschil van borstweeren daer daken op rusten  
(Discourse on parapets that support roofs)

*VII Van de oirdeningh der deelen eens huys als der camers lichtplaetsen, gaelderyen, hoven blocken ende ten laesten der deelen welcke een camer heeft*

(On the layout of the parts of a house, such as rooms, courtyards, galleries, gardens, blocks and finally of the parts of a room)

- 1 Van de vervoeginge der lichtplaetsen eens huys  
(On the disposition of courtyards in a house)  
[Vande looven der lichtplaetsen]  
( [On galleries in courtyards] )
- 2 Van de vervoeginge der lichtplaetsen eens blocks burgerlicke huysen  
(On the disposition of courtyards in a block of private houses)
- 3 Van de vervoegingh der camers of percken, die samen het huys maken  
(On the inclusion of rooms or compartments that together make up a whole house)
- 4 Van de verkiesinge der camers of percken, elck tot haer gebruyck met insicht door welcke dat men bequamelick gaen mach of behoort te gaen om tot de andere te comen en welcke niet  
(On the choice of rooms or compartments, each to its own use with an account of which ones one may properly go through to reach the other ones and which not)  
Vant open en toegaen der deuren, mitsgaders ghedachtenissen op sloten en sleutels  
(On the opening and closing of doors with reflections on locks and keys)  
[Ghedachtenissen op sloten en sleutels]  
( [Reflections on locks and keys] )
- 5 Van de vervoegingh der stucken, die in camers of percken vereyscht zijn, als steegers, portalen, schoorsteen, schryfkasten, heymelicken, fonteynen, brandinghplaetsen, regenpypen, leuven  
(On the disposition of parts, that are required in rooms or compartments, such as staircases, porches, chimneys, studies, privies, drinkung fontains, fireplaces, drainpipes, lean-to roofs)  
steegers  
(staircases)  
portalen  
(porches)  
[Hoemen de carpetten ande deuren en stijlen sal hechten sonder nagelen om die te connen afdoen als men wil]  
( [How one can attach the carpets to the doors and door jambs without nails so that one can take them down if one wants] )  
schoorsteen  
(chimneys)

- [Van Schoorstenen]  
 brandinghplaetsen  
 ( fireplaces)  
 [vande voordeelen en achterdeelen der stoven]  
 ( [On the advantages and disadvantages of furnace rooms] )  
 [Voordeelen]  
 ( [advantages] )  
 [Achterdeelen]  
 ( [disadvantages] )  
 schryfkasten  
 (studies)  
 heymelicken  
 (privies)  
 fonteynen  
 (drinking fountains)
- 6 Van de vervoeghing der hooven (with commentary on ‘regenpypen’  
 and ‘leuven’)  
 (On the disposition of gardens)
  - 7 Van de vervoegingh der gaelderyen  
 (On the disposition of galleriess, possibly part of ‘hooven met haer looven  
 tot bevrijding’)

*VIII Van de oirdeningh der steden*

(On the layout of towns)

- 1 Van de middelen daer men groote en machtige steden door maken can  
 (On the means with which great and powerful cities can be created)
- 2 Van de verkiesingh der plaetsen, daer men de steden wilt leggen  
 (On the selection of sites if one wants to layout towns)
- 3 Van de form der steden  
 (On the forms of cities)
  - Vande oirdening der kercken en Tuychthuysen  
 (On the layout of churches and houses of correction)
  - Van looven voor de Huijsen op beyden sijden der straten  
 (On galleries in front of the houses on both sides of the streets)
  - Vande lycksydighe vergrooting der stadt  
 (On the like-sided expansion of the town)
  - Verstercking der vierhoecken van kleinder tot Grooter  
 (Fortification of squares from small to large)

- 4 Vande Handel der Waterschuyring  
 (On the business of scouring water)
  - Vande Waterschuyring int gemeen  
 (On scouring water in general)
  - Vande Schuyring met sluysen  
 (On scouring with sluices)
  - Van de sluysen (Van de form der sluysen die mij best bevalt)  
 (On sluices – On the shape of the sluices that please me most)
  - Van de havens  
 (On harbours)
  - Van de hoofden  
 (On breakwaters)
  - Hoe men stilstaende stinckende grachten kan ververschen (?)  
 (How to freshen malodorous stagnant canals ( ? ) )
- 5 Hoe men omt verdrincken der steden te voorkomen, bedyckte landen  
 hoger doet wassen die daerme oock vruchbaerder syn  
 (How to enable dyked lands to rise in height in order to prevent the flood-  
 ing of towns and villages while ensuring that they also become more fertile)

*Verscheyden aenteyckeningen*  
 (Various Notes)

*Verscheyden aenteyckeningen van Metselrye, Van Timmeringh, Van Smedingh, Van Rook*  
 (Various notes about masonry, carpentry, forging and smoke)

- Van Metselarye  
 (On masonry)
  - Van backsteen, hartsteen en tegelen  
 (On bricks, stones and tiles)
  - Van calckmortel en trast (On lime mortar and trass)
  - Vant verbant der backsteen en hartsteen  
 (On bond with bricks and blue stone)
  - Van hooge sware metselrie  
 (Building large works in brick)
  - Waerom nieuwe metselrie tegen oude gewrocht altijd bevonden wat te  
 sincken en hoemen dat voorcommen can  
 (Why new brickwork built on old brickwork always sinks in a little and  
 how one can prevent this)

- Van hechting van hout en steen  
(On bonding woods and bricks)
- Van Timmering (On Carpentry)
    - Vande soorten van hout diemen in een landt gebruyckt als hier  
(On the sorts of wood that are used in a country such as ours)
    - Vander timmerliën hupsche reetschappen die een seltsaem werck doen  
(On beautiful tools of carpenters for doing superior work)
    - Vande vervouging der corbelen en van stooven  
(On the disposition of curved braces and stoves)
    - Vant lassen der balcken  
(On welding joists)
    - Waerom het dack van de sael inden Haeg so lange duert  
(Why the roof of the hall in The Hague lasts so long)
    - Vande rusting der daken op de muerplaten en echting des selfs solders  
ande muerplaten  
(On supporting roofs on the wall plates and tying attics to the wall  
plates)
  - Other notes
  - Van Yserwerck en van smedingh  
(On ironwork and forging)
  - Van Rook  
(On smoke)
    - Van Schoorstenen, te weten om die te veroirdenen datse wel roock  
trecken.  
(On chimneys to know how to plan them so that they draw smoke)
    - [1. Punt vande Spiegheleingh des roocz.]  
( [First point: On the theory of smoke] )
    - [2. Punt. Vande verscheyden middelen diemen tot elcke plaetsen  
ghebruyckt]  
( [Second point: On the different means that are used in each place] )

*Aenteijckeninghen op Serlijns en anderen / Inhoudende sommige geschillen*  
(Notes on Serlio and others/ Concerning some discourses)

- [1.] Geschil op maten der pilaren met haer aencleving  
(Discourse on the measurements of columns and all that appertains to it)
- [2.] Geschil opt gebruyck der pylaren tot cieraet  
(Discourse on the use of columns for ornament)
- [3.] Geschil op dicte en swaerte van pilaren  
(Discourse on the thickness and weight of columns)

- [4.] Geschil op architraven  
(Discourse on architraves)
- [5.] Geschil op clocken  
(Discourse on frontons)
- [6.] Geschil op Acroteria of pedestalen  
(Discourse on acroteria or pedestals)
- [7.] Geschil op uytsteecksels der gevels  
(Discourse on projections in façades)
- [8.] Geschil op beeldich cieraet en nitsen  
(Discourse on artistic ornament and niches)
- [9.] Geschil op hoogte der camers na reden haerder langde en breedte  
(Discourse on the height of rooms depending on their length and breadth)



‘De Huysbou’



# I Van de lycksydicheyt des gebous

## I.I VANDE BEPALINGH EN BESCHRIJVINGH DER LYCKSYDIGHEYDT

H. Stevin, *Materiae Politicae*, I *Onderscheyt Vande Oirdening der Steden*, pp. 11-17

d'Oirsaeck waerom ick hier mette Lijcksijdicheyt begin, is om de gene die uytter natuer daer in geen behaghen en hebben, metten eersten te waerschouwen, dat sy haren tyt niet en verliesen met hemlien in handel van bouconstige oirdening te oeffenen. Tot welcken einde ick de Lijcksydicheyt eerst bepalen sal, ende daer na haer eygenschappen opentlick verklaren, met voorbeelden des ghebous van Romeynen en Griecken die de Lijcksijdicheyt gageslagen hebben.

Het is te weten dat de menschen, ghelijck d'ander dieren, lichtelick het connen bouwen om beschermt te sijn teghen wint, regen snee, koude<sup>1</sup> en hitte, sonder daer toe onderwysing, of beschreven regelen te behoeven, maer wantmen om konstelijck te bouwen, de voorschreven Lijcksijdicheyt moet gaslaen, soo sal ick, die eerst aldus bepalen: *Lijckzijdicheydt is der rechter slijnckerdeelen eens lichaems overeencommingh in form grootheydt ende ghestalt.*

Als onder anderen de Lichamen der ghedierten in welcke het de natuer soo voorsien heeft, dat de deelen haerder rechter sijde evengroot, lijckformich en lijckstatisch sijn met die der slijncker, en de leden van diens soorte sy maer een en hebben, die staen ordentelijck in 't middel, tusschen beyde: By voorbeelt, des menschen eenige neus, mont, kin kommen int middel des aensichts, maer de parige als ogen, wijnbraeuwen, caken, oiren, die sijn met malcander evengroot, lijckformich oock vande middeldeelen evewijt en in gelijcker ghestalt. Maer somen de selve middeldeelen wil aensien voor besonder lichamen, men vint noch in yder de boveschreven gedaenten, als de eenige neus heeft haer twee lijckstandige neusgaten en soo voorts met d'andere. Dese eygenschap is in alle ghedierten, vande grootste totte cleynste soo gemeenen reghel, datmen 't voor Uytning<sup>2</sup> mach houden, daermen ergens 't verkeerde bevint,

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<sup>1</sup> Erroneously: 'houde'.

<sup>2</sup> In the margin: 'Exeptione'.

# I On the like-sidedness of buildings

## I.1 ON THE DEFINITION AND DESCRIPTION OF LIKE-SIDEDNESS

H. Stevin, *Materiae Politicae*, I *Onderscheyt Vande Oirdening der Steden*, pp. 11-17

The reason why I begin with like-sidedness, is to start by warning those who have no natural affinity with the subject not to waste their time studying architecture. I shall therefore start by defining like-sidedness and shall then clearly explain its properties using examples of buildings by the Romans and Greeks who studied like-sidedness.

It is well known that, like other animals, people can easily learn how to build for protection against the wind, rain, snow, cold and heat, without being taught to do so and without needing written rules. But those who wish to build aesthetically must observe the rules of like-sidedness. Therefore I shall begin by stating as follows: like-sidedness is the agreement of the right and left parts of a body in shape, size and appearance.

As with the bodies of animals, in which nature has ordained that the parts on the right be of equal size, shape and appearance to those on the left, and regarding parts which occur only in the singular, these being neatly positioned in the middle, between each side: a person's single nose, mouth and chin, for example, are in the centre of the face, but pairs, such as eyes, eyebrows, jowls and ears are of equal size, like-sided as well as equidistant from the centre and of similar appearance. Taking the central parts as bodies in themselves, this same phenomenon is found in each of these, so that the single nose has two nostrils of similar appearance and the same applies to the other parts. This characteristic is such a general rule among all animals, from the largest to the smallest, that it is considered exceptional when an incongruity is found, as in

als dat botten, tongen ende eenige andere platvisschen onlijkszijdighe hoofden hebben. Voort heeftet onsen Schepper soo geschickt, dat wy in sulcke Lijkszijdicheyt een behagen hebben, ende dat ons 't verkeerde onaengenaem is, want eens menschen aensicht, diens flincker syde meerder verheffing of daling heeft als de rechter, of dattet slinckerbeen van ander maecksel is dan het rechte, al waer elck op syn selven van goede form, wy achtent, om de Onlycksydicheys wille, voor mismaecktheydt, en dit uyer natuer; inder vougen, dat eenen die vorder vraegde de reden waerom ons sulcx niet en bevalt, en 't ander angenaem is, 't schijnt datmender op soude mogen antwoorden, 't selve, gelyck begin,<sup>3</sup> soo weynich voorder ondersouck te behouven, als waerom de bie heur uyer natuer verheucht in lieflicke welriekende bloemen het vercken in vuyle stinkende dreck. Dese Lijkszijdicheyt dan ons aldus uytter natuer behagende, en by sulcken gemenen regel inde form der gedierten plaets houdende, soo hebben de seer oude Boumeesters, die lange voor Vitruvius waren, met goede reden als voor Bouconstighe regel gheseydt,

*'t Gesticht moet wesen als een dier, en wanneer ment wil maken na 't behooren, men moet daer in de natuer volgen.* Waer by te verstaen is, dat, gelyck de Natuer of Schep- per der gedierten, de selve Lycksydicheyt geeft, alsoo moet oock de Boumeester<sup>4</sup> dat navolgen, en de gestichten met Lycksydicheyt veroirdenen: Gelyckmen metter daet bevint gedaen te sijn, inde vermaerde oude ghestichten, der Romeynen, noch in wesen, en ander daer ons teyckeninghen af naghelaten sijn: Sulcx dat de kennis des regels, deser diersche Lijkszijdicheydt, den Boumeester seer noodich is om gestichten constelick te veroirdenen, en daer af wel te oordeelen. Deur versuymenis deses regels, schijnt den vermaerden Boumeester Serlius t'onrecht begrepen te hebben, den Boumeester vande Diocletiaentsche baedstove, daer hy seght:

*Wy en behouven niet te spreken vande ghemiste ende ongeschickte reden der hoofden A, C, en B, D, diens uytterste deelen, men veroirdent siet met verschillende onghelijcke formen: Want soo groote openbare dwalinghen en sullen nimmermeer ontvlien het oordeel des verstandighen Boumeesters.* Maer anghesien A gelyck is B, en C met D, soo mochtmen daer op antwoorden, dat ghelyck eens peerts twee voorste beenen, met malcander gelyck sijn, en onghelyck mette twee achterste, dat alsoo de voorste deelen des gesichts A, B, wel verschillen meugen vande twee achterste C, D, (mits datse Lijckformich en evegroot sijn met malcander) nochtans daer in gevolght wesende, der gedierten Lyckszijdighe Eygenschap; Sulcx dat hier in, dies aengaende, de bouconstighe reghel naghecommen is, en dat niet alleen inde Diocletiaentsche baedstove, maer in veel meer andere oude vermaerde gestichten, daer diergelycke in bevonden wordt.

<sup>3</sup> In the margin: 'Principium'.

<sup>4</sup> In the margin: 'Architect'.

flounders, sole and other flatfish that have unlike-sided heads. Furthermore, our Creator has ordained that we should find pleasure in such like-sidedness and that its opposite should seem unpleasant to us, since we consider a person's face whose left side is higher or lower than the right side, or whose left leg is of a different build to the right, even though each is individually well formed, to be misshapen and against nature because of their unlike-sidedness, in the sense that were one to ask the reason why we find no pleasure in such things while the other appears attractive, one might answer that it requires little further investigation than the principle that the bee naturally prefers pleasant smelling flowers and the pig a disgusting malodorous mire.

This like-sidedness, which is naturally pleasing to us and is found in the shapes of animals according to the same principle, was with good reason declared by the most ancient architects, long before Vitruvius, to be an architectural rule, namely that 'a building should be like an animal, and if one wishes to make it correctly, one should follow nature'.<sup>1</sup> By which it should be understood that just as nature or the Creator of animals produces like-sidedness, so the architect should emulate this and design buildings with like-sidedness, as one finds was actually done in the famous ancient buildings of the Romans which still exist and others of which drawings have been left to us.

Thus it is essential for the architect to have a knowledge of the rules of animal like-sidedness in order to design buildings artistically, and to judge this properly. Through his neglect of these rules, the famous architect Serlius seems to have misunderstood the architect of the Diocletian bathhouse, when he claimed: 'Let us say nothing of the disregarded or faulty ratios for capitals A, C and B, D, whose extremities appear to be designed with different, unequal forms: because such gross public errors will never again escape the judgment of intelligent architects'. But since A matches B, and C matches D, one might respond that, just as a horse's two front legs are alike, but not like the two back legs, so the front parts of the building A and B may differ from the two back parts C and D (as long as these are of the same shape and size) following again the like-sided nature of animals. So that here, in this respect, the architectural rule is followed, and not only in the Diocletian bathhouse, but also in many other famous old buildings in which similar like-sidedness is found.

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<sup>1</sup> For this passage see Isaac Beeckman's commentary in 'Journael', folio 229 verso line 23-folio 230 recto line 3.

De Grieken hebben in plaets deses woordts Lycksijdigheyt gebruyct *Symmetria*, beteyckenende t'Saemmaticheydt, daer sy mijns gevoelens by verstonen, dat de maten der lijckformige deelen, vande rechte ende slincker sijde eens gestichts t'samen moeten overeencommen. En byaldienmen 't selve woordt t'Saemmaticheydt, nu in sulcke beteyckening an naem alsdoen, en in 't gebou by gemeene regel dadelick soo volgde, ick souder oock by blijven, om met het Griecx te meerder overeencomming te hebben, maer dat niet sijnde, sal 't woort Lijcksijdicheyt nemen, als van claerder beduyding der sake, en bequamer om de voorschreve diersche gedaente in 't gebou beter te mogen bedocht worden, en meer in 't gebruyck te geraken dan sijder nu in is. Angaende ymant mocht voorwenden dat Vitruvius met syn Uytlegghers,<sup>5</sup> het woordt t'Saemmaticheydt in ander beteyckening nemen, seggende dat, gelyck de maet der grootheydt van des menschen voet, een seker reden heeft tegen die des hoofts, en dat sonder de selve reden, de mensch mismact soude sijn, alsoo moeten oock de maten vande deelen des gestichts tot malcander een seker reden hebben, soudense niet mishagelick wesen, besluytende in sodanige overeencomming de voorschreve t'Saemmaticheyt te bestaen: Maer ghemerct sulcke Onlycksijidige deelen van menschen, geen gemeenschap en hebben met deelen van gestichten, ja dat d'ander gediertens voeten en hoofden met menschen voeten en hoofden niet everedenich en syn, soo en dient dit tot geen regel, om in 't oirdenen van ghebou ons na te rechten: 't Is wel waer dat ghelyck yder ghediertens leden wel veroirdent sijn, datmen alsoo der gestichten deelen oock wel moet veroirdenen, 't welck soo veel is als oft men seyde: Om een ghesticht wel te veroirdenen, men moetet wel veroirdenen, maer 't selve niet dan verhael des begins<sup>6</sup> sijnde, soo en schijnter niet uyt te konnen getrocken worden, leering der sake daer wy na trachten: Maer met t'Saemmaticheyt verstaen synde [gelijck vooren geseyt is] een t'samen overeencomming van de maten der lijckformige deelen van rechter ende slincker syde, eens gestichts, en dat int veroirdenen der gestichten dadelick nagekomen, soo volgtmen daer mede natuer in haer making der Lijcksijdige gedierten, na 't inhoudt der voorschreven oude Boumeesters reghel. Men mocht oock vermoeden, dat, soo de ouden in plaets van 't Saemmaticheyt, het woordt Lijcksydicheyt gebruyckt hadden, dat sulck misverstant daer na inde bouconst niet en soude gevallen hebben.

Nu hoewel hier voren geseyt is de Lycksydicheyt ons uytter natuer te behaghen, nochtans vintmender eenighe dieder luttel me vermaect syn, en int gebou niet op en passen, ja liever Onlycksydichteyt hebben, voortbringende de gemeene spreucke *verscheydentheydt behaecht*,<sup>7</sup> daer noch by vougende

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<sup>5</sup> In the margin: 'Commentatoribus'.

<sup>6</sup> In the margin: 'Repetitio Principio'.

<sup>7</sup> In the margin: 'Varietas delectat'.

Instead of the word like-sidedness, the Greeks used *symmetria*, meaning proportionality, since in my opinion they thought that the dimensions of the similarly-shaped parts of the right and left sides of a building should agree. And were this word proportionality to have the same meaning as it did then and be adhered to by common consent in architecture, I would also employ it in order to agree more closely with the Greek. But since this is not the case, I shall use the word like-sidedness as a clearer term for the concept and a more effective way of indicating the aforementioned animal-like shape of a building, and to bring this into greater usage than is now the case.

Regarding the suggestion that Vitruvius and his commentators employed the word proportionality with a different meaning, namely that just as the size of a person's foot is related to that of the head and that without this order a person would be misshapen, so the dimensions of the parts of a building should be related to each other in order not to appear unpleasant, concluding therefore that this kind of similarity is what is meant by proportionality: since the unlike-sidedness of parts of people has nothing in common with that of the parts of buildings, indeed that other animals' feet and heads are not equally proportioned to human heads and feet, this cannot serve as a rule on which to base the design of a building. It is true that just as each animal's members are well designed, so too the parts of buildings must be well designed, which is as much as to state that to design a building well, it must be well designed, this being simply a repetition of the principle we cannot deduce the knowledge we desire from it about the subject. Proportionality, being understood (as stated above) as the agreement of the dimensions of the similarly-shaped parts of the right and left sides of a building, where this has actually been followed in the design of buildings, nature's work in the formation of like-sided animals has also been followed, in accordance with the aforementioned rule of the ancient architects. One might even suspect that if, instead of using proportionality, the ancients had used the word like-sidedness, these misunderstandings would never have occurred in architecture.

Now, although it has been suggested that like-sidedness is naturally pleasing to our nature, nevertheless there are some who find little pleasure in it and pay no heed to it in architecture, indeed, they prefer unlike-sidedness, giving rise to the familiar saying 'Variety is the spice of life', adding that beautiful landscapes

dat schoone lantschappen, met bergen, dalen, velden, bosschen en rivieren, sonder Lycksydicheyt syn, en nochtans seer behaechelick; Met welcke menschen het toegaet, in dese stof gelyckt doet met eenige, die ick gageslagen heb in stof des sancx, te weten; datter ghevonden worden met natuerlick scherp verstant begaeft, welcke tot hare jaren gecomen synde, niet thoneren en connen, als singende een liet, en connen by den toon niet blyven, ja al songen sy oock met ymant anders die 't wel can, 't welckmen nochtans bevint gedaen te worden by ettelicke onnosele kinders van drie of vier jaren, oock by slecht geboren menschen, ja dat meer is, men leert sommige onvernuftige volgenkens op corter tyt in gesanck eens liets by den thoon blyven, daer de voorschreve scherpsinnige menschen, al de dagen haers levens niet toe geraken en connen. D'oirsaeck hier af mochtmen vermoen oft quaem deur gebreck in form of stof des Reetschaps<sup>8</sup> daermen me singt, te weten de keel, en oft hier me mocht toegaen gelyckt met fleuten, hebbende qualick geboordegaten, daermen geen goe thoonen me blasen en can; Maer ten schynt niet uyt oirsaeck datse, gelyck ick by eenige ondersocht heb, niet oirdeelen en connen, welcke thoonen van twee verscheyden de hoochste of leechste is, welcke twee thoonen, als die der mishagelicke tweede of lieflicke vyfde het angenaemste geluyt maken: Nu gelyck de gene die deur sulcke onvolcommenheydt der natuer niet thooneren en connen, hemlien niet en behooren te moeyen met Sangmeesters ampt te bedienen, of Singconstich gesang te maken,<sup>9</sup> alsoo behooren de gene die deur onvolcommenheydt der natuer, inde Lycksijdicheydt geen behagen en hebben, hun niet te becommen met in Boumeesters ampt te treden, als daer toe onbequaem wesende. Onder sulcke en moet Syn VORSTELICKE GHENADE niet gherekent worden, welcke soo ick eerst in sijn dienst quam, my in gheschil van stercktebou, eens dese woorden seyde: *Ick gevoel in my een genegentheydt, van bolwercken en wallen op d'een sijde der Steden soo te veroirdenen, als op d'ander, en wanneer ick deur ongelegentheydt der plaets anders moet doen, dat gaet my tegen 'thart. Ick en weet niet of ick my selven met ongegronde dingen quelle of dattet eenighe natuerlicke reden heeft.* 't Welck my wel bevallende als dergelicke aert in my gevoelende, en in meer ander menschen dadelick bemerckt hebbende, antwoorde hem daer op, de menschen int ghemeen daer toe ghenegen te zyn, en 't verkeerde gebreck inde natuer te schijnen, dat verstijvende mette voorsz. seer oude Boumeesters<sup>10</sup> gemeene regel der diersche Lijcksijdicheyt, verthoonende hem oock de boveschreven regelen in schrift, die ick daer te vooren tot ghedachtenis by bouconstige stof geleyt had, welcke hy overgelesen hebbende, creech een ver-

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<sup>8</sup> In the margin: 'Instruments'.

<sup>9</sup> In the margin: 'Musique te componere'.

<sup>10</sup> In the margin: 'Architecten'.

with mountains, valleys, fields, woods and rivers, although without like-sidedness, are still extremely pleasing.<sup>2</sup> These people are similar in this respect to individuals whom I have observed in connection with singing, namely, those who are naturally blessed with a perceptive mind, but who have grown up over the years without being able to deliver the right note when singing a song or to hold the note, yes, even when singing with someone else who can, like untutored children of three or four might do, or people with inborn defects, indeed, even more so, one may in a short time teach unschooled students to stay in key when singing a song, while the aforementioned perceptive people would come nowhere near doing so even if they tried all their lives. The reason for this appears to stem from a deficiency in the shape or substance of the instruments with which one sings, that is the throat, and as with flutes with distorted apertures, it is impossible to sound the correct notes. However, it seems not to be caused, as I have discovered in some cases, by an inability to judge which of two different tones is higher and which lower, which two notes, whether a dissonant second or a harmonious fifth, makes the more pleasant sound. Now, just as those who through such imperfections of nature are unable to distinguish notes may as well not bother to practice the profession of master singer, or attempt to compose musical songs, in the same way, those who, as a result of a fault of nature, are unable to appreciate like-sidedness should not bother attempting to take up the profession of architect, being unsuitable for the task.<sup>3</sup>

Not to be included among these is His Noble Grace, who, when I first entered his service, once said the following in a debate on fortifications: “I sense in myself that I prefer to order the defences and walls on one side of cities in the same way as the other, and if the adverse circumstances of a location force me to do otherwise, this goes against my feelings. I do not know whether I torment myself with things that are unfounded or whether there is some natural reason for it.” This pleasing me as a sentiment which I also felt and which I had noticed in other people as well, I responded that people usually tend to prefer this, while the opposite indicates a fault in nature, supporting this with the aforementioned general law of animal like-sidedness of the ancient architects, showing him also the rules cited above, with which I introduced the discussion of the subject of architecture, having read which, he felt reassured

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<sup>2</sup> On this and the following passages see Beeckman’s commentary in ‘*Journal*’, folio 230 recto lines 8-9.

<sup>3</sup> On this and the following passage see Beeckman’s comments in ‘*Journal*’, folio 230 recto line 4-6.



nougen vant geene daer hy in getwyffelt had, geloovende dat sijn genegentheyttotte Lycksijdicheytt in natuerlicke reden bestont.

This passage has not survived complete.

One of the missing passages dealt with possible differences between sections of a plan in which like-sidedness is maintained:

Isaac Beeckman, 'Journael', folio 231 recto line 36 - folio 231 verso line 3:  
gelijckseydicheytt [in the margin]

T'gebou moet sijn gelijk en dier 't sij vogel, visch of cruijpende of ander, daerin siet men dat de rechtersijde wel is gelijk de slijncker, maer het voorste en is niet gelyck het achterste Daerom en ist oock niet needsackelijck in de huijsbouw het achterste te maken gelijk het voorste.

I.2 VANDE LYCKSYDIGE OIRDENINGH DER ROMEYNSCHE BURGERLICHE HUYSEN  
From H. Stevin, *Materiae Politicae, Byvough der Stedenoordening*, pp. 41-47

Hier vooren gheseyt synde vande lijcksijdicheydts bepalingh, met naerder uytleggingh vandien, ick sal nu, volghens het eerste voornemen, hare eyghenschappen noch opentlijcker verclaren met voorbeelden des ghebous van Romeynen ende Griecken ; Op dat, benevens de voorgaende redenen, hemlien Achtbaerheydt<sup>11</sup> my helpen mach tegen de geene die myne boveschreven Lijcksijdighe oirdeningh, die int volghende oock gageslaghen sal worden, voor ongegronde eyghensinnicheydt mochten beschuldigen: Hier benevens soo sal deur dese beschrijvingh, 't gebou na de wyse der ouden bekent mogen worden by de gene dieder niet af en weten, en lust toe mochten hebben. Om dan tot de sake te komen, ick sal eerst seggen

Vande Lycksydige Oirdeningh der Romeynsche Burgerlicke Huysen.

't Is te weten dat Vitruvius in sijn seste boeck ant 3e Hooftstick, verclarende der Romeynen ghebou, tot voorbeelt neemt vierhoeckige huysen, in 't middel met een open Lichtplaets,<sup>12</sup> hebbende na de straetsyde een Voorloof,<sup>13</sup> so langh als de breedte der lichtplaets, sonder camers daer achter te kommen: Om 't welcke naerder te verclaren, so hebben de uytleggers van Vitruvius tot sijn redenen, daer de formen overal by gebreken, teyckeningh vervoucht als volcht:

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<sup>11</sup> In the margin: 'Authoritas'.

<sup>12</sup> In the margin: 'Atrium'.

<sup>13</sup> In the margin: 'Vestibulum'.

about that which he had doubted, realising that his preference for like-sidedness was founded on natural reason.

This passage has not survived complete.<sup>4</sup>

One of the missing passages dealt with possible differences between sections of a plan in which like-sidedness is maintained:

Isaac Beeckman, 'Journael', folio 231 recto line 36 - folio 231 verso line 3:

*Like-sidedness* [in the margin]

*The building must be like an animal or a bird, fish or crawling creature or other, in which one sees that the right side is the same as the left, but the front is not the same as the back. Thus it is also unnecessary in architecture to make the back the same as the front.*

## 1.2 CONCERNING THE LIKE-SIDED ORDER OF ROMAN PRIVATE HOUSES

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 41-47

Having discussed the definition of like-sidedness, with additional explanations, I shall now, according to my original plan, expound in greater detail on its properties, citing examples of Greek and Roman buildings,<sup>5</sup> so that, along with the previous reasons, their authority will support me against those who criticise my aforementioned like-sided layout, which is also examined in the following section, as an unfounded idiosyncrasy. Here, this description of the architecture of the ancients will also enable those who know nothing about this to become acquainted with it and appreciate it. To come to the point, I shall start with a discussion on the like-sided layout of Roman private houses.

Concerning the like-sided order of Roman private houses

Note that Vitruvius<sup>6</sup> in his sixth book of the third chapter describing Roman architecture, takes the rectangular house as an example, having an open courtyard at the centre, on the street-side a porch, as long as the width of the courtyard, without rooms behind it. To explain this, since there were no illustrations, the commentators on Vitruvius added drawings to elucidate his arguments as follows:

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<sup>4</sup> See Appendix E, 'Notes on the unfinished Huysbou, p. 492: Hendrick Stevin', in *Materiae Politicae*, 1, chapter 3, 'Onderscheyt van de Oirdeningh der steden', p. 25 (i.e. p. 17).

<sup>5</sup> That this part follows directly after 'Vande Bepalingh En Beschrijvingh Der Lycksydigheydt' is evident from Appendix E, 'Notes on the unfinished Huysbou, p. 493: Hendrick Stevin', in *Materiae Politicae*, 'Byvough der Stedenoirdening', chapter 1, p. 41. He notes here that this part necessarily follows the third chapter on the town planning which corresponds to the aforementioned chapter.

<sup>6</sup> The name Vitruvius appears twice erroneously in this paragraph. Otherwise the architect's name is generally spelled correctly.

Laet in dese eerste form A B C D den gront der voorschreven [ill. 21] vierhoeckighe huysingh bedien, met een open Lichtplaets E F G H en de I, is de Voorloof, diens tipkens beteyckenen de pilaren die na de straet sijde staen, tot onderhouding van 't Voorloofdack. Haer ghebruyck was om de ondersaten, en ander die den Heer quamen groeten, buyten reghen en heet sonneschijn in te staen, tot dat sy in gelaten wierden, alsoo datse daerentusschen, hoewel niet eyghentlijck binnens huys sijnde nochtans niet en schenen heel daer buyten te wesen, oock hadde de Ionckheyt, haer heeren verwachtende, daer in haer cortswijl, met den bal te slaen en andere verscheyden spelen haer te oeffenen. De ommestaende percken sijn keucken, eetcamer en ander noodighe camers, uytcommende op de licht plaets, onder welcke K. de Juweelkamer<sup>14</sup> bediet.

De lichtplaetsen wierden in ettelicke huysen ghemaect met Loooven tegen de sijden, sommighe sonder Loooven; Die geen en hadden, waren of boven heel open, of bedeckt. De heel op lichtplaets hiet *Atrium* of *Cavædium displuviatum*: De bedecte *Cavædium testudinatum*, wiens dac of overwelfsel ruste op pilaren, dieder boven op de sydmuren stonden, daer het licht tusschen deur quam, genoegsaem gelijk nu de overdeckte caetspelen, die haer licht van ter syden krijgen, tusschen de stijlen die het dack dragen.

De lichtplaetsen met Loooven waren drierley d'eerste met vier balcken, van d'een muer tot d'ander, sonder met pilaren onderstelt te wesen, en hiet *Cavædium Tuscanicum*, Maer *Cavædium tetrastilum* als<sup>15</sup> vier pilaren waren in elcken hoeck een; En *Cavædium Corinthium*, hebbende meer dan vier pilaren, oock so dat de Loooven tegen de sijdmuren, niet en geraeckten. De daken der voorschreve Loooven quamen verder uyt te steken over de pilaren, dan de wyse der Loooven diemen nu gebruyckt, sulcx dattet vierhoeckich gat, 't welck int middel bleef, soo seer vercleende, als hier onder geseyt sal werden, en hiet by hun *Impluvium*, dat soo veel als regengat betekent.

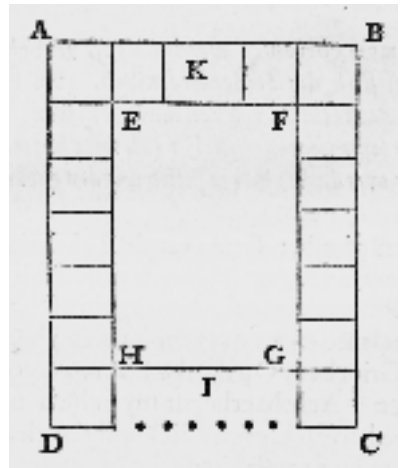
Maer om de gedaente der voorschreven Loooven en regengat naerder te verclaren, so laet in dese tweede form, de vierhoeck E F G H even en gelijk sijn mette lichtplaets E F G H [ill. 22] der eerster form, wiens E F, F G, G H, H E haer vier sijdmuren beteyckenen I K, L M, N O, P Q sijn vier balcken

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<sup>14</sup> In the margin: 'tablinum'.

<sup>15</sup> Erroneously: 'alsler'.

In the first figure, let A, B, C and D represent the plan [ill. 21] of the aforementioned rectangular house, with an open courtyard E, F, G and H and I being the porch, the dots representing the columns on the street-side, holding up the porch roof. This allowed servants and others who came to greet the master of the house to stand out of the rain and the sun until they were let in, so that in the meantime, although not actually inside the house they did not appear to be completely outside, and also for youngsters who, while waiting for their masters, could pass the time knocking a ball around or playing some similar game. The surrounding areas are a kitchen, dining room and other essential rooms, leading into the courtyard, including K, the treasury.

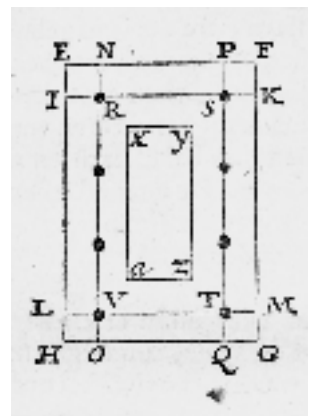


ill. 21

In many houses the courtyards were built with galleries along the sides, while others were built without. Those which had none were either open to the sky, or roofed. The open courtyard is known as an *Atrium* or *Cavædium displuviatum*: the covered type is called *Cavædium testudinatum*, with a roof or vaulting resting on columns above the side walls with the light entering pleasantly as in today's indoor fives courts where the light enters from the side, between the posts that support the roof.

There are three types of courtyards with galleries. The first, having four beams from one wall to the other not supported by columns, is called a *Cavædium Tuscanicum*; if it has four columns, one at each corner, it is known as a *Cavædium tetrastilum*, and a *Cavædium Corinthium* if it has more than four columns so that the galleries are not attached to the side walls. The roofs of the aforementioned galleries jutted further over the columns than is customary today, so that the rectangular space remaining in the centre, which they called an *Impluvium*, meaning roughly, rain hole, was very small, as described below.

But to demonstrate the appearance of the aforementioned galleries and rain hole, let the rectangle E, F, G and H in the second figure match and correspond with the courtyard E, F, G and H [ill. 22] in the first figure, where E to F, F to G, G to H and H to E represent the four side walls, I to K, L to M, N



ill. 22

van d'een muer tot d'ander, malcander cruycende ande vier punten R, S, T, V, waer onder geen pilaren sijnde, 't was *Cavædium Tuscanicum*; Ende vier pilaren daer onder commende, als ter plaets van R, S, T, V, het hiet *Cavædium tetrastylum*; Maer hebbende meer dan vier pilaren, ghelijck aenghewesen wordt mette tippels onder de twee balcken N O, P Q, en dattet loofdack teghen de mueren niet en gherocht, so was 't *Cavædium Corinthium*: Wyder soo quam het dack, ghelijck gheseyt is, verre over de pilaren, als neem ick tot X Y Z a, blyvende int middel den vierhoek X Y Z a, als regengat.

Op de vier syden van dit regengat, wierden ribben ghestelt, die daer teghen haer vasticheydt namen, en schoens, opwaert streckten over de bovecanten der mueren, om daer op het dack te legghen, waer af in de volghende stantteyckenigh noch naerder verclaringh kan ghetrocken werden.

De ghestalte des gevels wordt anghewesen met dese derde form A B C D E F G H I K L M N O, wesende stantteyc [ill. 23] keningh, waer in M I even sijnde met D C der eerste form, ghenomen wert, met haer plat rechthoekich, te staen opt plat der 1 form; Dese L K is even met G H der 1 of 2 form; Dese E F met X Y breedte des reghengats; Dese E B beteyckent een der ribben, die van des reghengats syde E, komt over de balck aen D, daer de pilaren, onder commen, en van daer schoens opwaerts strecken, over des muers bovecant C tot B, om op sulcke ribben te legghen het dack B E, vant welck, mitsgaders vant dack G F, het reghenwater valt; en op de buyten syden langs de daken, als B A, G H.

Tot hier toe dese grontteyckeninghen en stantteyckeninghen verclaert sijnde, soo sullen nu de maten volghen ghetrocken uyt Vitruvius 4 Hoofdstick sijns 6 boecx.

De langde en breedte der lichtplaetsen namen sy op drierley wyse, als in reden van 5 tot 3. van 3 tot 2. en van / 2 tot 1.

Haer hoochde, vanden vloer tot de dweersbalcken, die het loofdack draghen, als inde 3 form vande vloer L K. tot D. was van  $\frac{3}{4}$  der langhde, dat is  $\frac{3}{4}$  A D der langhde inde 1 form.

Als de lichtplaets lanck was van 30 tot 40 voeten, het derdendeel van dien wiert voor breedte der twee vleughels gheschickt: Maer sijnde van 40 tot 50 voeten, men nam de  $\frac{2}{7}$ : Ende van 50 tot 60 het  $\frac{1}{4}$ : Van 60 tot 80 de  $\frac{2}{9}$ : Van 80 tot 100 het  $\frac{1}{5}$ .

Wanneer de breedte der lichtplaets inhielt 20 voeten, de  $\frac{2}{3}$  vandien waren voor de Juweelcamer:<sup>16</sup> Maer sijnde van 30 tot 40, men nam de  $\frac{1}{2}$ : Ende van 40 tot 60 de  $\frac{2}{5}$ .

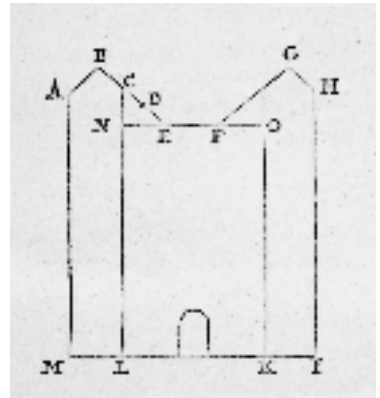
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<sup>16</sup> In the margin: 'tablinum'.

to O and P to Q the four beams from one wall to the other, crossing each other at the four points R, S, T and V, under which there are no columns, this being a *Cavedium Tuscanicum*. If four columns are placed underneath R, S, T and V, it is a *Cavedium tetrastilum*. If it has more than four columns, as shown with the dots under the two beams N to O and P to Q, and if the gallery roof does not reach the walls, it is a *Cavedium Corinthium*. Where, as stated, the roof extends beyond the columns, I take this to be X, Y, Z and *a*, the remaining rectangle X, Y, Z and *a* in the centre forming the rain hole.

On the four sides of this rain hole rafters would be placed and fixed against it, and extended up diagonally over the top of the walls to the roof, of which the following elevation provides an additional illustration.

The appearance of the façades is demonstrated with this third figure A, B, C, D, E, F, G, H, I, K, L, M, N and O, being an elevation [ill. 23] in which M to I corresponds with D to C in the first figure, its surface standing at right angles to the surface of the first figure. Here L to K corresponds with G to H in the first and second figures; E to F with the width X to Y of the rain hole; E to B represents one of the rafters which extend from the side of the rain hole E, over the beam at D, under which the columns stand, and continues diagonally up over the top of the wall C, to B, on which rafters the roof, B to E, is laid from which, as with the roof G to F, the rainwater falls; and on the outside from the roofs, namely B to A and G to H.



ill. 23

Having explained these plans and elevations, the dimensions are taken from the fourth chapter of the sixth book of Vitruvius. Here the length and width of the courtyards is calculated in three different ways, as a ratio of 5 to 3, of 3 to 2, and of the square root of 2 to 1. Its height, from the floor to the cross-beams holding up the gallery roof, as in the third figure from the ground L to K, to D, being three quarters of the length, that is three quarters of the length A to D in the first figure. If the length of the courtyard is between 30 and 40 feet, the width of the two wings is a third. But if it is between 40 and 50 feet, it is two sevenths; and between 50 and 60, a quarter; between 60 and 80, two ninths; between 80 and 100, a fifth. Where the width of the courtyard measures 20 feet, two thirds of this is for the treasury: but where this is between 30 and 40, it is half; and between 40 and 60, two fifths. The height of the treasury

De hoochde der Juweelcamer tot de balck, wert veroirdent met daer toe te doen het  $\frac{1}{3}$  der breedte; Ende hier by gevoeght het  $\frac{1}{3}$  haerder breedte, de somme was voor de hoochde der solder.

De ganggen, daermen van d'een plaets tot d'ander doorginck, wierden inde cleene lichtplaetsen veroirdent uyt  $\frac{2}{3}$  vande breedte der Iuweelcamer; Inde groote uyt de helft.

De beelden met haer cieraet stonden so hooch, als de vleugels der lichtplaets breed waren.

De deuren op de Dorische wyse sijnde, men gafse Dorische breedte: De Ionische veroirdendemen na den Ionischen eysch.

Voor breedte des reghengats en wiert niet min ghenomen dan het vierendeel, noch meer dan het derdendeel van de breedte der lichtplaets: Syn langhde na gheleghentheydt der langhde vande selve lichtplaets.

De Eetcamers half soo breed als lanck.

Om te hebben de hoochte van al de lanckworpighe camers, sy vergaerden hare langhde tot breedte, den helft daer af, hielden sy voor 't begeerde. Maer soo Stoelpercken<sup>17</sup> of groote camers viercant waren, sy vergaerden tot hare breedte den helft, nemende de somme voor hare hoochde.

Benevens de voorgaende grontteyckeningen der Romeynscher Burgerlijcke huysen, soo synder noch verscheyde manieren van ghemene ghestichten, wiens formen, van die seer verschillen, ghemaect sijnde elck na den eysch van hare ghebruyck; Als kercken; Stadt huysen, Theatren bycans een half ront, ghelijck waren *Theatrum Scauri, Pompei, Marcelli*, wesende tonneelen om camer spelen, tumeling, springing, en dierghelijcke in te sien: *Amphitheatrum*, datmen Ronttonneel mocht heten, was eysche-wyse, als *Amphitheatrum Statilij. Tauri, T. Vespasiani, Claudij*, waer in vele menschen, deur hope van opghestelde prijzen te winnen, tegen wreede wilde ghedierten vochten, tot welck schrickelijck spel oock de verwesen en krijgsgevanghenen ghedronghen wierden: Voort *Naumachia*, dat Schipstrijt betekent, welck tonneel diende om de Romeynsche Ieucht te leeren de manier van oirloch te water te voeren, als *Naumachia Circi Maximi, Domitiani, Neronis, Caesaris*; Inde selve lietmen, deur seker sluyse, het worstelperck, tusschen de trappen des tonneels, vol waters loopen, en 't spil ten eynde sijnde, liep deur een ander sluyse, weerom daer uyt. Ander tonneelen waren lanck en smal, van form bycans, als een kegels Wassendesne,<sup>18</sup> by hun oock *Circi* gheheeten, diens voornaemste gebruyck was tot worsteling en loopingh om prijs met wagens en peerden rontom seker Naelden,<sup>19</sup> daer in staende, aen beyde eynden. Sulcke waren *Circus Maximus, Floratium Flaminij, Neronis*,

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<sup>17</sup> In the margin: 'Sedilarium'.

<sup>18</sup> In the margin: 'Hyperbola'.

<sup>19</sup> In the margin: 'Pyramides'.

to the beam, is calculated on the basis of a third of the width; and a third of its width is the height of the attic. The corridors, which lead from one place to the next, are calculated in the small courtyard at two thirds the width of the treasury; the large [courtyard], half. The statues, with their decoration, were as high as the width of the courtyard wings. The doors being in Doric style are of Doric width; the Ionic are ordered according to the Ionic requirements. The width of the rain hole is no less than a quarter, and no more than a third of the width of the courtyard: its length depending on the length of the same courtyard. The width of the dining rooms is half the length. To calculate the height of the long rooms, the length is added to the width, subtracting half to arrive at the required total. But for sitting rooms or large square rooms, half is added to the width, the sum producing the height.

Besides the ground plans of Roman private houses outlined above, there were many other ways of making public buildings in a wide variety of shapes, each based on the requirements of their purpose; such as churches, town halls, theatres, almost semicircular, like the *Theatrum Scauri*, *Pompeii*, *Marcelli*, being stages on which plays, acrobatics, jumping and suchlike could be seen. The *amphitheatrum*, known as a theatre in the round, was oval, like *Amphitheatrum Statilii*, *Tauri*, *T. Vespasiani* and *Claudii*, where many fought cruel, wild animals in the hope of winning one of the prizes, a horrific sport to which slaves and prisoners-of-war were also condemned. At the *Naumachia*, which means a naval battle, the presentation was intended to show the youth of Rome how to conduct battles at sea, as at *Naumachia Circi Maximi*, *Domitiani*, *Neronis* and *Cæsaris*. At this location the wrestling arena between the podium stairs was flooded with water, fed through certain sluices which arena, when the games were ended, was then drained through another sluice. Other theatres were long and narrow, almost conically tapered. They called these *Circi* and their principal purpose was for wrestling and racing chariots and horses around needles erected at either end. These included the *Circus Maximus*, *Floratium Flaminii*, *Neronis*, *Alexandri* and *Antonini*. The Roman baths, which they called *Thermae*,



*Alexandri, Antonini*. De Romeynsche Baedstoven, die by hun Thermæ hieten, hadden oock haer bysondere form, met worstelpercken, tonneelen en boschen, als *Thermæ An bonianæ, Diocletianæ, Decianæ, Varianæ, Trajani, Philippi, Imperatoris, Gordiani, Olympiadis, Novatianæ, Agrippinæ, Neronianæ, Alexandrina, Hadriani, Severianæ, Constantina, Aureliana* en meer andere.

Tot hier gheseydt sijnde vande Lijcksijdicheys oirdening der Romeynsche ghestichten, ick sal nu segghen,

1.3 VANDE LYCKSYDIGHE OIRDENING DER GRIECKSCHE BURGHERLYCKE HUYSEN.

From H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 48-50

Welcke getrocken is uyt Vitruvius 6 boeck in 't 10 hoofdstick, waer af de volgende grontteyckeninghe dusdanighe beduyding heeft.

- A de voorpoort.<sup>20</sup>
- B de voorganck,<sup>21</sup>
- C Peertstallen.<sup>22</sup>
- D De wachters plaetsen.<sup>23</sup>
- E Eerste lichtplaets of omstijling.<sup>24</sup>
- F Twee middel ganghen.<sup>25</sup>
- G Twee gastcamers.<sup>26</sup>
- H Twee slaepcamers der gasten.<sup>27</sup>
- I Twee Eetcamers der gasten.<sup>28</sup>

Van dese gastcamers, seght Vitruvius in sijn 6 boecx 10 hoofdstick, dusdanighe redenen: Alsoo de Griecken seer na de wellust, leefden, en van weghe 't gheluck, machtich waren, sy bouden eyghen huysinghen met eetcamers, slaepcamers, en kelders, bestelt met leeftocht voor vremde gasten die hun besochten, welcke sij den eersten dach ten Avontmael noden, ten laetsten sonden sy hun hoenderen, eyeren, moeskruyt, boomfruyt, en ander acker ghewas; want

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<sup>20</sup> In the margin: 'Ingressus'.

<sup>21</sup> In the margin: 'thyorium'.

<sup>22</sup> In the margin: 'Equilia'.

<sup>23</sup> In the margin: 'Cellæ ostariæ'.

<sup>24</sup> In the margin: 'Peristilium primum'.

<sup>25</sup> In the margin: 'Mesaule'.

<sup>26</sup> In the margin: 'Hospitalia'.

<sup>27</sup> In the margin: 'Cubicula'.

<sup>28</sup> In the margin: 'triclinia'.

also had an unusual form, with wrestling rings, theatres and groves, as for example Thermæ Anthonianæ, Diocletianæ, Decianæ, Varianæ, Traiani, Philippi, Imperatoris, Gordiani, Olympiadis, Novatianæ, Agrippinæ, Neronianæ, Alexandrinæ, Hadriani, Severianæ, Constantinæ, Aurelianæ and many others.

Now that the like-sided ordering of Roman buildings has been explained, I shall discuss,

### I.3 THE LIKE-SIDED ORDERING OF GREEK PRIVATE HOUSES

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 48-50

Which is based on Vitruvius, in the tenth chapter of the sixth book, to which the following ground plans refer.

- A The front door
- B The entrance passage
- C Stables
- D Porters' rooms
- E First courtyard or peristyle
- F Two central corridors
- G Two guest apartments
- H Two bedrooms for guests
- I Two dining rooms for guests

Concerning the guest rooms, Vitruvius provides the following explanations in the tenth chapter of his sixth book. Since the Greeks had a more luxurious lifestyle and through good fortune became powerful, they built their houses with dining rooms, bedrooms and cellars filled with provisions for guests who visited from abroad, inviting them to dinner on the first day and on the last, sending them chickens, eggs, vegetables, fruit and other farm produce, so that

alsoo en schenen sy niet vreemde gasten, maer selfs huysvaers te wesen, hebbende in dese gastlogysten een afgesonderde vryheyt.

- K Omslaepcamering,<sup>29</sup> die soo gheuoemt schijnt, van weghen dattet ses slaepcamers sijn, streckende om de lichtplaets, te weten op drie sijden.
- L Steunstijlplaets,<sup>30</sup> dien Naem hebbende, om datse tusschen seker steunstijlen<sup>31</sup> staet.
- M Twee worstellooven<sup>32</sup> daer de Worstelaers hun winterdaechs in oefenen.
- N Twee groote huysinghen<sup>33</sup> daer de Huysmoers met wolwerck haer sitsteden hebben.
- O Twee Vraulogysten<sup>34</sup>
- P Twee Vrouwe slaepkamers.<sup>35</sup>
- Q Grootte lichtplaets ofte omstijling hebbende een hoochste loove.<sup>36</sup>  
[ill. 24]
- R De hoochste loove.<sup>37</sup>
- S Boeckcamers en huysinghen,<sup>38</sup>
- T Twee Iuweelcamers.<sup>39</sup>
- V Twee Cyzycenische eetcamers,<sup>40</sup> misschien alsoo genoemt,<sup>41</sup> om datse waren op de wijze van Cyzicum in Propontide, of Cyzicum in Bithynia, beyde voormaels groote Steden.
- X Twee Looven ande Cyzicenische eetcamers.<sup>42</sup>
- Y Viercante Huysinghen.<sup>43</sup>

Tot hier toe de Grieksche grontteyckeningh beschreven sijnde, soo machmen daer in merken (ghelijck oock inde Romeynsche teyckeningh) hoe sorchvuldelyck sy de Lijcksijdicheydt volcommelick gageslaghen hebben, niet alleen inde uyterlijke gevels, maer oock inde inwendighe camers, en percken, die over al op d'een sijde als op d'ander commen.

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<sup>29</sup> In the margin: 'Perithalamus'.

<sup>30</sup> In the margin: 'Parastas'.

<sup>31</sup> In the margin: 'Freyton'.

<sup>32</sup> In the margin: 'Hypetra loca seu xystos'.

<sup>33</sup> In the margin: 'Occi magni'.

<sup>34</sup> In the margin: 'Gynæconitides'.

<sup>35</sup> In the margin: 'Cubicula. Muliebria'.

<sup>36</sup> In the margin: 'Perystylum amplum unam habens porticum Rodiacum appellatum'.

<sup>37</sup> In the margin: 'Rodiacum'.

<sup>38</sup> In the margin: 'Bibliothecæ & Occi'.

<sup>39</sup> In the margin: 'Pinacothecæ seu rablina; Gall. Cabinets ou Garderobes'.

<sup>40</sup> In the margin: 'Cyzycena triclinia'.

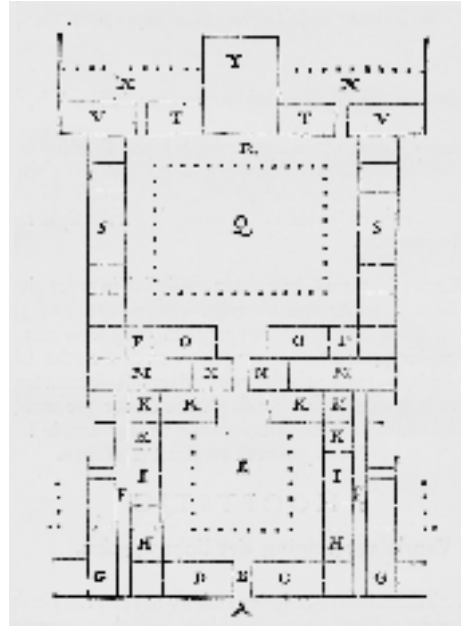
<sup>41</sup> Erroneously: 'genoemd'.

<sup>42</sup> In the margin: 'Porticus ad triclinia Cyzycena'.

<sup>43</sup> In the margin: 'Occi quadrati'.

instead of being foreign guests they were like heads of households, having complete freedom in their guest apartments.

- K Surrounding sleeping quarters, apparently called this because they comprise six bedrooms arranged around the courtyard, on three sides
- L Pillar place, given this name, because it is situated between certain pillars
- M Two wrestling galleries for wrestlers to exercise in the winter
- N Two large apartments for the women of the house to sit and work with wool
- O Two women's apartments
- P Two women's bedrooms
- Q Main courtyard or peristyle with the upper gallery  
[ill. 24]
- R The upper gallery
- S Libraries and apartments
- T Two treasuries
- V Two Cyzician dining rooms, known as such because they are based on the style of Cyzicus in the Propontis or Cyzicus in Bithynia, both at one time major cities
- X Two galleries adjoining the Cyzician dining rooms
- Y Square apartments



ill. 24

Now that the Greek ground plan has been described, it is noticeable (as in the Roman plan) how carefully they observed the [requirements of] like-sidedness, not just in the external façades, but also in all the inner rooms and spaces, both on one side and the other.

De voorschreven Ghestichten constelick in koper ghesneden, en nu ter tijdt overvloedelick in druck uytgaende, soude ick hier by hebben moghen voughen, met verclaringh der gedaente van haer gebou, en de diersche Lijcksijdicheydt daer in gagheslaghen; Maer salt deur ander belet overslaen, en laten voor de gheene dieder toe mochten belusticht sijn, achtende hier me mijn voornemen, de Lijcksijdicheydt angaende, genoegh verclaert te hebben.

I would have added the aforementioned buildings, which have been engraved on copper and are currently available in print in large numbers, with descriptions of the appearance of the construction and the animal-like like-sidedness that can be observed in them,<sup>7</sup> however, circumstances having forced me to omit this; I must therefore consider that for those who are interested, I have, with regard to my purpose concerning like-sidedness, explained enough.

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<sup>7</sup> For this passage see Beeckman's commentary in 'Journael', folio 230 recto lines 10-12.

## II Vande onderaertsche wercken

### II.1 VAN DE GRONDTVASTINGH

This section is missing, but the following notes by Beeckman reveal something of the contents.

Isaac Beeckman, 'Journael', fol. 194r:

*Welsandt quomodo fiat* [in the margin]

*Stevyn seght seer wel in de pampieren van de Boukonst dat het sandt welsandt wort als het water van het landt daer rontsom hoogher staet in de aerde dant op dat sandt doet, want dan syncket van onder opwaert door het sandt om even hooghe te syn. Ende so gebeuret oock, dattet somtyts welt, ende somtyts niet en welt, naerdat de nevenstaende landen drooch of waterich worden.*

Isaac Beeckman, 'Journael', fol. 229v lines 16-22:

*Sandt onder water is vaste gront* [in the margin]

*Sandt onder water liggende, maeckt vaste grondt, want het water vervult de ledige plaetsen tusschen de sandekens soodat het geperste sant niet wijcken en can. men vint sandt daermen qualyck met scherpe schuppen in geraecken can. men moet de heypalen door het drooge sandt slaen tot in het harde.*

*Te Rotterdam is een qua modderige grondt van 60 voet van dick, daer geen heypalen lanck genoegh toe syn.*

### II.2 VAN DE BORNPUTTEN, POMPEN, SANTBORING

*En eerst van Bornputten.*

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 83-85

't Is voor een Huys groot gerief te hebben syn eygen water, om allen ogenblick, so wel by nachte als by dage, dat te mogen gebruycken, sonder t'elckens daerom te moeten buytens huys gaen an Fonteynen, Rivieren of tot syn Nabueren. Vyt dese oirsaeck worden de Putten ernstelick bedocht by verscheyden vande Bouconstschryvende; als Vitruvius in syn 8 bouck seggende onder anderen

## II On underground structures

### II.1 ON FOUNDATIONS

This section is missing, but the following notes by Beeckman reveal something of the contents.

Isaac Beeckman, 'Journael', fol. 194r:

*Quicksand quomodo fiat* [in the margin]

*In his papers on architecture, Stevin states clearly that sand becomes quicksand when the water of the surrounding land is higher in the soil than it is in that sand, because it then seeps upwards from below through the sand to attain the same height. Sometimes it wells up and sometimes not, depending on whether the adjoining land is dry or wet.*

Isaac Beeckman, 'Journael', fol. 229v lines 16-22:

*Sand beneath water is firm ground* [in the margin]

*Sand beneath water forms firm ground, because the water fills up the spaces between the sand so that the compressed sand cannot give way and since it is difficult to dig into it with sharp spades a pile is needed to strike through the dry sand to the solid bottom.*

*Rotterdam has muddy soil to a depth of 60 feet, for which no pile is long enough.*

### II.2 ON SPRING WELLS, PUMPS AND DRILLING IN SAND

*And first on wells.*

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 83-85

It is particularly convenient for a house to have its own water, to be able to use it at any time, night or day, without constantly having to go outdoors to a fountain, river or neighbour. That is why several authors on architecture have considered wells seriously; like Vitruvius, who writes in the fourth chapter, for example, of the eighth book about what he has read regarding water



int 4 Hoofdstick, vant water gelesen te hebben Theophrastus, TimFus, Posidonius, Hegesias, Herodotus, Aristides, Metrodotus. Na Vitruvius hebben Plinius, Palladius en meer ander daer af geschreven; welke de gene, die 't lust lesen mogen. Maer wantmen daer niet en vint 't gene van dies hier onlanx in Hollant te voorschyn gecommen nieu gevonden is, soo sal ick dat verclaren; te weten het booren van putten tot over de 200 voeten diep, en dat op corten tijdt met clene cost: sulcx datmen nu in venige en modderige landen, niet alleen en ontmoet verscheyden wateren, d'een beter als d'ander, maer men can oock dadelick sien, wat verscheyden stoffen soo diep in d'eerde leggen, waer me een oirsaeck geopenbaert is, om met ander kennis daer af te spreekken, danmen te vooren gedaen heeft: sulcx dat ick acht dit te meugen gerekent worden onder de groote vonden, die niet alleen t'onsen tyden, maer over veel hondert Iaren, tot 's menschen kennis gecommen zijn.

Constantijn Huygens, Manuscripts, KB-K.A.XLVII, Fol. 147r

Om den manier van Booringh te verclaren soo sal ick beschrijven 't geene daer aft dadelijck gebeurt is onder anderen tot Amsterdam indt out mannen huijs alwaer geboort is sulcken put 232 voeten diep op den tijt van 21: daagen hebbende gecost so van booren als ander oncosten 500 gulden waer over doende waaren 5 mannen te weten den meester met nogh 4 ander ende ende wert aengevangen den 16 junijs in t Jaer 1605

De diepten op elcken dagh gheboort was als hier onder den 16 junij diep geboort 51 voeten

17 - 22  
18 - 14  
19 - 12  
20 - 17  
21 - 16  
22 - 14  
23 - 14  
24 - 11  
25 - .9  
27 - .8  
28 - 10  
29 - .5  
30 - .5  
1 Julius 6  
2 - .5  
4 - .4  
5 - .3

in Theophrastus, Timaeus, Possidonius, Hegesias, Herodotus, Aristides and Metrodotus. Besides Vitruvius, Pliny, Palladius and others also wrote about this; which those who wish may read. But since the new invention that has recently appeared in Holland is not found in any of these, I shall describe it; namely, the drilling of wells of over 200 feet deep in a short time and at little expense. Not only can water be found in muddy and peaty soil, each [well] better than the next; one can also actually see which materials are hidden deep in the earth, revealing information with which to refute other opinions previously held, so that I consider this to be among the great innovations that, not only in our times but over many hundreds of years have contributed to human knowledge.

Constantijn Huygens, *Manuscripts*, KB-K.A.XLVII, Fol. 147r<sup>8</sup>

To explain the drilling method I will describe what actually happened at, among other places, the old men's home in Amsterdam where a well 232 feet deep was drilled by five men, namely the master and four others, in a period of 21 days beginning on 16 June in the year 1605, with drilling and other expenses amounting to 500 guilders.

The depths drilled each day were as follows, with 51 feet being drilled on 16 June.

17 June – 22 feet  
18 June – 14 feet  
19 June – 12 feet  
20 June – 17 feet  
21 June – 16 feet  
22 June – 14 feet  
23 June – 14 feet  
24 June – 11 feet  
25 June – 9 feet  
27 June – 8 feet  
28 June – 10 feet  
29 June – 5 feet  
30 June – 5 feet  
1 July – 6 feet  
2 July – 5 feet  
4 July – 4 feet  
5 July – 3 feet

---

<sup>8</sup> The passage begins with 'Dit volgende genoomen uijt Stevijn'.

6 - . 2  
 7 - . 2  
 8 - . 2

---

somma 21 dagen 232 voeten

De gronden sijn int booren bevonden alsvolght

1 gehoogde aerde	7 voeten
2 darij en veen	9
3 withe kleij	9
4 sandt	8
5 aerde	4

---

dus ver Stevijn 37 voeten

dit volgende uijt het gedruckt  
 briefje daer van uijt gedaen

6 kleij	10	
7 aarde	4	
8 sant	10	daer amsterdam meest op fondeert
9 kleij	2	
10 wit sandt	4	
11 swaerte aerde	5	
nota 12 mollem	1	
13 sandt	14	
14 santachtighe cleij	3	
15 sant met kleij vermenght	5	
16 sandt en hornen schilpies	4	

---

facit 99 voeten

17 na deese 99 voeten

is een kleij rit van

suijver kleij 102

18 sant 31 voeten daer de booringh ofte  
 gravingh in gebleeven

6 July – 2 feet  
 7 July – 2 feet  
 8 July – 2 feet

---

total in 21 days 232 feet

The following soils were discovered during the drilling

1 heaped earth	7 feet
2 clay peat and peat	9 feet
3 white clay	9 feet
4 sand	8 feet
5 soil	4 feet

---

37 feet

Thus far Stevin<sup>9</sup>

The following is from the printed letter<sup>10</sup>

6 clay	10 feet
7 soil	4 feet
8 sand	10 feet, on which Amsterdam is largely built
9 clay	2 feet
10 white sand	4 feet
11 rich soil	5 feet
nota 12 humus	1 feet
13 sand	14 feet
14 sandy clay	3 feet
15 sand mixed with clay	5 feet
16 sand and horn shells	4 feet

---

facit 99 feet

17 after these 99 feet is a  
 clay layer of pure clay 102 feet

18 sand 31 feet to which the drilling  
 or excavation reached

---

<sup>9</sup> For this passage see Beeckman's commentary in 'Journael', fol. 23 or lines 16-20.

<sup>10</sup> Although it refers to an addition printed later it is likely that the letter was found among the *Huysbou* papers and that Stevin intended to supplement his earlier list of soil types with a more detailed one, based on his own information. Beeckman adopted the details when he was studying the manuscripts in Hazerswoude and Hendrick Stevin also included them in his list in the *Materiae Politicae*. See Beeckman, 'Journael', fol. 23 or lines 28-39 and H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, p. 84.

dit volgende weder uijt Stevijn

doen de booringh gedaen was ter beschreeven diepten van 232 voeten soo was den Radt van eenijghen dat ment ter wijl dat met soo kleene cost en geschieden nogh wel dieper soude geboort hebben om te sien wat vreemdicheyt soo van gronden als 't geene anders hadt mogen ontmoeten, dogh wert endtlijck beslooten beij die diepten te laten berusten.

From a note by Hendrick Stevin it is clear that the passages on the 'shape of the drill' and the 'method of drilling' should follow here.

Van de Gedaente des Boors.

Constantijn Huygens, *Manuscripts*, KB-KA.XLVII, Fol. 147v

[ill. 25]

Des Boors Form wert door de volgende teijckeningh aldus verclaert AB is een viercandt hout hebbende onder een eijseren pinne waer aen comt een bagger net C met sijn snijdende buegel en soo dicht gebreijt datter geen sant door sijpen can de drie gaten int hout sijn om daer door te steeken een stock als D ende daer mee int booren het hout AB te drayen op sijn penne ende alsoo het baggert net te vollen met stoff diender in comt Booven aent hout beij A is een korff beset met eijseren beugels teegen het splijten waer in commen magh het onderste van een ander hout gelijk t'voorgaende als hier EF deese twee houten worden t' saem vast gemaect met den eijseren bout G ende gelijk hier is het hout EF alsoo worden der meer gemaect soo veel noodich is om t'een int ander te steeken totte begeerde diepte te coomen.

The following again from Stevin<sup>11</sup>

When the drilling was completed to the depth of 232 feet as described, some advised that, since it could be done at such small cost, they should drill even deeper to see what kind of strange soils or other materials they could find. However, it was eventually decided to stop at this depth.

From a note by Hendrick Stevin it is clear that the passages on the 'shape of the drill' and the 'method of drilling' should follow here.<sup>12</sup>

#### On The Shape of the Drill

Constantijn Huygens, *Manuscripts*, KB-KA.XLVII, Fol. 147v

[ill. 25]

In the following drawing the shape of the drill is explained. A, B is a square timber shaft with an iron pivot supporting a dredge net, C, with a cutting edge, so finely knit that no sand can seep through. The three holes in the wood are for inserting sticks, like D, with which to turn the shaft – A, B – on its pivot during the drilling and so fill the dredge net with the soil that enters it. At the top of the shaft, A, is an arch bracketed with iron hoops to prevent it splitting where the bottom of another timber shaft similar to the previous shaft, shown here as E, F, is inserted. These two timber shafts are linked with an iron bolt, G, and like the timber shaft, E, F, as many more of these are made as are needed to insert into one another to obtain the required depth.



ill. 25

<sup>11</sup> This sentence indicates that the following passage is taken directly from Huygens's copy of the Huysbou manuscript. The same passage, with occasional spelling variations, appears in H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, p. 85.

<sup>12</sup> See Appendix E, Notes on the unfinished Huysbou, p. 495: H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, p. 85.

[ill. 26]

Men heeft ver langhen tijt met seer groote havegeenen wel in d'eerde geboort om t'onder souken de gronden daermen sluijsen water moolens en ander swaer gestichten op bouwen wil oock mede om te weeten hoe diep veen/darije/cleij en ander stoffen leggen maer doen men daer mee onder water in drijffsant quam so en condemen meerder niet uijt reghten door dien dattet havegeer uijt getrocken sijn de het sandt vande canten weerom inde put viel ende die vulde—dit voorcoomen van deese swaricheijt bestaet de voornaemste oorsaeck deseswonderbaerlijcken vondts weesende alleenelijck daer in geleegeen datmen die put die men boort ghedeurichlijck met water moet opgevult houden wandt dat hoogher sijnde dant onder aertsche water soo perst het water des puts uijtwaers teegen het sandt dat in sijn reghte standt houdende, daer anders het onder aers water van buijten in de put dringende het sandt der canten daer in doet vlieten, welke nootsaeckelijckheijt oock bemerckt wort int uijthoosen van wateren leggende op modderighe oft weecke gronden die als dan vant water ontlast sijnde inde graght soo op coomen dat huijsen en ander gestichten daer omtrent staende na de selve weijcken ende in perijckle geraken van vallen soo in Hollandt tot verscheijden plaetsen gebleeken is

Maer want hem ijmandt verwonderen moght hoe drie ofte vier voet water binnen den put hooger dan buijten sulcken stercken persingh soude connen maaken van het sandt alsoo in sijn reghte standt te houden sonder vallen soo can daer aff wisconstelijck rekeningh gemaect worden deur het voor voorstel [...] des [...] bouckx vande Beginselen des water wights: al waer blijkt dattet water van binnen den put beij voorbeelt 4 voeten hooger sijnde dan van buijten dat als dan teegen elcke voet vlackx der binnen sijde die onder den booven cant vant omstaende leeghste water is perst 4 teerlincsche voeten waters meer dan teegen de buijten seijden welck elck genoomen tot 65 pondt ront het gewicht van 260 ponden, meerder off minder verschil van hooghde des binnen en buijte waters soude meerder oft minder persingh meebrenghen.

Aldus dan verclaert sijnde de oorsaeck hoe dattet welsandt de canten vanden geboorden put over ende blijft staende soo sal ick commen tottet schrijven vande manier des booren, t welck is dat het net al draijende vol stoff gecoomen sijnde men treckt t'elckens op en wert geledicht. Ende een stock diep genoegh sijnde, men steectker booven een ander in die met den ijseren pen vast makende Ende alsser alsoo veel stocken deen booven d'ander sijn tis hemelijck datmen om elck gevolt net op te haalen die stocken d'een voor d'ander

## Method of Drilling

Constantijn Huygens, Manuscripts, KB-KA.XLVII, Fol. 147v -148r

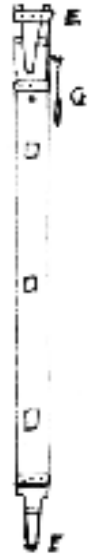
[ill. 26]

For many years large augers have been used to drill into the ground to examine the soil on which a dam, water mill or other massive building is to be built, as well as to find out the depth of the peat, sludge, clay and other soils. But when quicksand under water was reached it was no longer possible to continue because when the auger was extracted the sand fell through the sides into the well and filled it up again.

Solving that problem is the main purpose of this wonderful invention which is based simply on the fact that the well under construction must be kept constantly filled with water, since as long as this is higher than the water table, the water in the well pushes outward against the sand, which stays firm. Otherwise the pressure of the groundwater on the well from outside causes the sand on the side to spill inwards, a phenomenon which is also observed when draining water from muddy or soggy ground where sometimes, when the water has been drained, the canal houses and other buildings nearby subside and threaten to collapse as has occurred in various places in Holland.

But for those who wish to know how three or four feet more of water in a well than outside can exert such powerful pressure on the sand as to keep it upright and prevent it caving in, a mathematical calculation can be made using proposition [...] in book [...] of *De Beghinselen des Waterwichts* which demonstrates that where the water in the well is, for example, four feet higher than that outside, each foot on the inside that lies below the surrounding water table provides four cubic feet of water more pressure against the outside, each being 65 pounds with a total weight of 260 pounds, depending more or less on the level of the water table inside and outside.<sup>13</sup>

Having explained the reason why quicksands surrounding the sides of a drilled well remain firm, I shall now describe the method of drilling. This is that the net is turned and filled with soil and then repeatedly drawn up and emptied. And once the shaft is deep enough, another is placed above it fastened with an iron bolt. And when several shafts are connected one above the



ill. 26

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<sup>13</sup> For this passage see Beeckman's commentary in 'Journael', fol. 230r, lines 21-27. This and the other dotted lines correspond with the text. Stevin probably intended to insert information from other published works or notes.



na moet aff doen en om weeder van nieus te booren dat men deen stock voor d'ander na weerom moet aen doen.

De put alsoo tot begeerde diepte gheboort sijnde t'welck int voorschreven outmannen huijs was als geseijt is 232 voeten soo worden daer in geworpen soo schilpen 12 voeten hoogh Ende houten pompen daer op gestelt den een in d'ander sluijtende tot booven toe welcke altijt int water staende niet en verrotten, dit volbraght sijnde wert bevonden datter was een gedeuringh loopende Fonteijn van 11/2 voet hooger vallende dant gemeene water des graghts, dit water loopende in een back wert dan uijt gepompt om te beesegeen ende comt alsoo inden back op 24: uren omtrent [...] tonnen waters en d'oorsaeck van het booven geschreeven geduerigh loop 1 1/2 hoogher dant gemeen water schijnt dat het landt van weegen de hooghe wateren hoogh door weeckt sijnde dan het gemeen water daer in hooger uijt can loopen.

De reeden warom men dat in een back laet loopen en dan uijt pompt is om dat men alsoo groote meenichte van vergaert water heeft dat met der haest magh uijt getrocken worden, twelck beij al dien mondt uijt den houten pomp trock sonder back soo haest niet en soude connen volgen Ende oorsaeck sijn dattet sandt van onder geweldeger soude op coomen doch de pompen nogh meer vervullen dan nu geschiet.

Merckt bevonden te sijn dat op den tijt van [...] jaeren het sandt in de pompen van onder op waert gecoomen is [...] voeten sulckx dat de diepte dieder eerst was van 232 voeten nu allenelijck is van [...] voeten: dogh en is dit van geen verlanck wandt het water evenwel uijt de selve diepte comt.

#### Vande diepte der bornputten

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 127-128

[ill. 27]

Men soude menen dat hoe dieper bornputten hoe beter water; Maer 'tghebeurt somwijlen anders. Om 'twelck te verklaren, ick seg aldus: Laet A een ondiepe bornput sijn, B een diepe, van C tot D is suyver sant sonder stanck, van D tot E is stijncenden gront. Hier uyt volght dat al 't water 't welck inde bornput B comt, deur stijncende gront moet lijden, maer dat in A comt niet, want gheen onderereetsche water en comt opwaerts dan by gheval. Maer soo van E tot F weerom suyver santgront waer, en dat de buyse B neerwaert quam tot G

other, each time a full net is raised the successive shafts are usually removed and then replaced, one shaft onto the next, to resume drilling.

When the well has been drilled to the desired depth which, as stated, was 232 feet at the aforementioned old men's almshouse, shells are thrown into it to a depth of twelve feet and timber pumps are placed, each fitting onto the other up to the top, which do not rot since they are constantly under water. This having been done, the result was a constant jet of water one and a half feet higher than the normal water of the canals, the water flowing into a cistern was then pumped out to be used. And so in 24 hours around [...] barrels of water are produced. The cause of the aforementioned jet one-and-a-half feet higher than the normal water appears to be the high water table, the ground water being too high for the ordinary water to flow away.<sup>14</sup>

The reason why the water is allowed to flow into a cistern and is then pumped out is that a large quantity of accumulated water can be kept that can be quickly drawn on, which if it had to be extracted with the timber pump without a cistern it might not be fast enough. And the reason for that is that sand might rise from below with greater force thereby blocking the pumps even more than now.

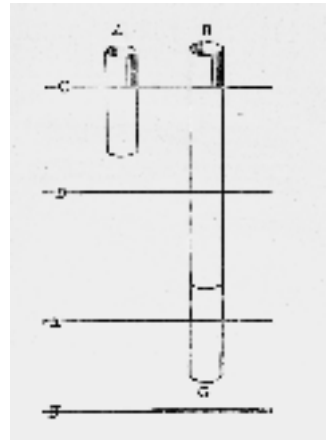
Note that it has been discovered that in [...] years [...] feet of sand has risen from below in the pumps so that the depth that was at first 232 feet is now only [...] feet. Yet this is of no consequence since the water still rises from the same depth.

On the depth of wells

H. Stevin, *Materiae Politicae, Byvough der Stedenoirde-ning*, pp. 127-128

[ill. 27]

Some might imagine that the deeper the well the better the water; but sometimes this is not the case. To explain this, I state as follows: Let A be a shallow well, B a deep one, from C to D is pure sand without odour, from D to E is malodorous soil. It follows that all the water that enters well B, passes through the malodorous soil, while it does not enter A since no groundwater flows upwards



ill. 27

<sup>14</sup> See previous note.

<sup>15</sup> For this passage see Beeckman's commentary in 'Journael', fol. 230v, lines 15-18.

tusschen E en F, alsdan soude den stanck des waters die het ghecreghen hadde tusschen D. E, weerom gesuyvert worden deur het sant tusschen E. F; Maer het water deur A commende is aldersuyverst, om dattet deur gheen stijckende gront en comt.

Isaac Beeckman, 'Journael', fol. 230v line 30:

*bornputten* [in the margin]

*De dieptste bornputten en sijn niet altijd de beste maer die haer water door sandige grondt ontfangen*

Isaac Beeckman, 'Journael', fol. 225v lines 1-8

*water een putken, waer uut volghet dat den pilaer water rechthoekig opt gat geduijrljck doort gadt valt sonder dat het nevenstaende water naert gadt comt, gemerckt elck deel vant nevenstaende water recht nederwaerts druckt op de grondt daert op staet. Vrage of het opgaende water dat meteen [spuijt/speuijt] opgestegen wordt oock sulck een pylaer maeckt van de grondt beginnende ofte dat het bovenste nevenstaende water eerst opcomt.*

Isaac Beeckman, 'Journael', fol. 230r lines 13-15

*bornputten* [in the margin]

*De bornputten worden best met hardbacken steen ende trast omsedt, opdat het water van onder door het quelmsandt, en niet van tersyden door modderigge grondt, daerin comen soude.*

Isaac Beeckman, 'Journael', fol. 230v lines 13-14

*Het water dat uut desen geboorden put quam was bequam om mede brouwen.*

### II.3 VAN DE REGENBACKEN

*Nu vande Regenbacken.*

H. Stevin, *Materiae Politicae*, Byvough der Stedenoordening, pp. 85-90

Benevens Bornputwater dat tot d'een plaets beter is als tot d'ander, en niet overall can gecregen worden, soo bevintmen het regenwater inde huyshouding seer noodich, als tot lywaet te wasschen, om dat de zeepe in putwater gemeenelick schift of cabbelt, en niet en suyvert; voort om erreweten en sommige ander dingen me te sieden, en coken dat met putwater, niet wel en can gedaen worden. Vyt dese oirsaeck ismen tot veel plaetsen, daer rivieren noch fonteynen en sijn seer becommert om bequame regenbacken te maken, daer af hier na geseyt sal worden, eerst verclaert zijnde een gemeen ongeval dattet regenwater van de daken crijcht: 'tIs te weten dat na langh drooch weer, het

except by chance. But if on the other hand the soil from E to F is pure sandy soil, and if column B descends as far as G, between E and F, then the smell of the water that enters between D and E would again be purified by the sand between E and F. Nevertheless, the water from A is the purest of all because it does not flow through any malodorous soil.

Isaac Beekman, 'Journael', fol. 230v line 30:

*Wells* [in the margin]

*The deepest wells are not always the best, but those that obtain their water through sandy soil.*

Isaac Beekman, 'Journael', fol. 225v lines 1-8

*Water and wells, from which follows that a column of water perpendicular to the hole falls through the hole constantly without the surrounding water coming through the hole, since all the surrounding water presses straight down on the ground it covers. Ask whether the rising water that [spouts] directly upwards also produces a column from the ground up or that the upper level of the surrounding water rises first.*

Isaac Beekman, 'Journael', fol. 230r lines 13-15

*Wells* [in the margin]

*Wells are best lined with bricks and trass, so that water is able to enter below through the quicksand, rather than from the side through muddy soil.*

Isaac Beekman, 'Journael', fol. 230v lines 13-14

*The water entering from this well was good for making beer.*

### II.3 ON CISTERNS

*Now about Cisterns*

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 85-90

Besides groundwater, which is better in some places than in others and which cannot be obtained everywhere, rainwater is also considered essential for households, for instance for washing linen, since soap in groundwater normally makes suds and bubbles and does not clean; also for soaking peas and such like, and for boiling which is not possible with groundwater.<sup>16</sup> For this reason considerable attention has been given to making effective cisterns in places without either rivers or springs. Which I shall now discuss, first stating a general problem of rainwater on roofs: namely that after extensive dry

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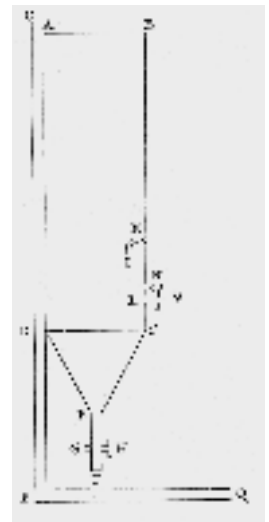
<sup>16</sup> For this passage see Isaac Beekman's commentary in 'Journael', fol. 230v lines 19-20.

slyck op de straten tot stof gedroocht zijnde, en van de wint om hooch inde locht gedreven wordende, het geraeckt also op de daken en inde goten tus-schen beyden, 't welck daer na vanden regen afspoelt en weerom in slyck ver-andert, gelijkmen metter daet sien can als men gaslaet het swart water dat na lange droochte met sulcken eersten regen uyt de goten comt. Noch gerakender inde goten doode muysen en ratten, dreck van catten, gevogelten en ander vuylichey, welke eintelick al inde regenback vlieten, Maer 't gene alsoo inde regenback gelopen is, en daer stil staet, laet syn slyck te gronde sijnnen, verga-rende op den bodem een voet of twe dick, meer of min na dat den regenback lange of corten tijdt ongesuyvert gestaen heeft, oock na dat de daken daer in waterende groot of cleen veel of luttel zijn. Dit regenwater geduerelick op sulcken vuylen gront liggende, wort daer af wormich en te styncken. Om dese swaricheyt te voorcommen, soo maectmen gemeenelick nevens den regen-back, als ontfanger, een suyver back, wesende de muer tusschen beyden van weyckbacksteen, daer 't water deur sypt uyt den ontfanger, wordende also ge-suyvert. Daer isser oock die nevens den eesten suyverback, stellen een tweede, oock wel een derde, om 't water alsoo van d'een in d'ander sypende, claerder en claerder te maken; maer wanttet al comt uyt den eersten stynckende regen-back, die als ontfanger dient, soo en ist inde sypbacken soo goet niet, gelijckt syn soude alst inden regenback suyver waer. Nu om dat daer toe te brengen, en te beletten het ongeval van die vergaring des slycx inden regenback, soo heb ick daer toe seker middel versocht en goet bevonden, 't welck aldus toegaet: Ick heb doen maken een rechthouckigen loyen regenback in een houten raem vervaet, hebbende onder een spitsen punt trechtersche wyse, in wiens uysterste buyse een groote copercraen comt, om daer me te twe of drie maenden, of soo dickwils als men wil, het slyck datter in vergaert is, af te tappen. Laet tot opentlicker verclaring van dien A B C D den voorschreven rechthouckigen loyen regenback beteyckenen, in een houten raem vervaet, hebbende onder den spitsen punt C D E F trechtersche wyse, in wiens uysterste buyse, gelijk van E tot F, comt een groote copercraen als GH, welke open gedraeyt zijnde, soo loopt al het slyck uyt datter in dien trechter vergaert is, volgende terstont het claer water; 't welck gecommen zijnde, en die craen weerom toegedraeyt wesende, soo is 't water vant slyck voor datmael ghesuyvert. Noch heb ick hier in doen maken een loyen buysken als I K L M, met een cleen craenken by 't einde an N, waer deur het water loopt van I opwaert na K, en van daer neer-waert dalende en uytcommende an M, om dat tot syn gerief te besigen. Des buyskens cromheyt van I tot K opwaert is op [ill. 28] datter geen gruyts noch vuylichey in en sijckte, gelijckt soude doen, alst water niet also opwaert en moest loopen, O P is een loyen buyse om het regenwater datter noch comt, als de back al vol is, deur te vallen inde gote P Q, en om van daer voort te wech te

weather, the mud in the streets, having dried and turned to dust, is blown high into the air by the wind and lands both on the roofs and in the gutters between them, where it is washed away by the rain and turns into mud once more, as can be seen when observing the black water washed out of the gutters with the first rainfall after an extensive drought. Dead mice and rats, droppings of cats, birds and other rubbish also ends up in the gutters, which eventually drifts into the cistern. But the mud that has flowed into the cistern and lies stagnant there, can sink to the bottom, accumulating to a foot or two deep, according to the length of time that the cistern has remained uncleaned, and also whether the roofs that water it are large or small, many or few. This rainwater continually lying on filthy ground like this, becomes infested and begins to smell.

To solve this problem, a water filter is normally built beside the cistern, as a reservoir with a wall of porous bricks, so that the water seeps out of the reservoir and is thereby cleaned. Some people place a second, and even a third filter beside the first water filter, because as the water seeps in this way from one to the other, it becomes more and more pure; but although it first comes from the malodorous cistern that serves as a reservoir, it is not as good in the water filter as it would be were it clean in the cistern. Now to make it so and to solve the problem of mud accumulating in the cistern, I found a certain method and demonstrated that it works. Which is as follows: I had a rectangular lead cistern made in a timber frame, with a tapered point under it in the form of a funnel, with a large copper tap attached at the far end of the pipe to tap off the mud that accumulated there every two or three months, or as often as required.

For a fuller explanation of this let A, B, C, D represent the above-mentioned lead cistern, constructed in a timber frame, with below it the tapered point C, D, E, F in the shape of a funnel, with a large copper tap G, H attached at the far end of the pipe E to F, which, when opened, allows all the mud that has accumulated in the funnel to flow out, resulting immediately in clean water. For once this is done and the tap has been turned off, the water is then cleansed of mud. I also had a lead pipe I, K, L, M made, with a small tap at the end at N. [ill. 28] The water flows up from I to K, and down from there arriving at M, where it is available for use. The upward curve of the pipe from I to K ensures that no grit or filth settles in it, as would happen if the water did not flow upward. O, P is a lead pipe for the [excess] rainwater to flow when the cistern is full, pouring through into the gutter P, Q, and draining away.



ill. 28

lopen. Merckt noch dat overmits desen regenback niet onder d'eerde en comt na de gemeene wyse, maer daer boven staet, soo heeftmender dit voordeel uyt: datmen 'twater niet en behouft met emmers te putten, of met pompen op te trecken als van d'ander, dan staet altyt gereet om door de cranen getapt te worden. Maer wanttet deur versuymenis geschien conde dat ymandt int dagelicx gebruyck het craenken, als an N, mocht laten op staen, waer deur al 't water of een groot deel uyt den regenback mocht verlooren loopen, soo machmen daer boven een loyen vatken veroidenen 't welckmen met sijn besonder craen mach vullen, en daer uyt tappen met een ander craenken soo lange alst water vant selve vaetken duert, want dan de boveschreven versuyvynis<sup>44</sup> schoon gebeurende; soo en cander maer dat besonder vaetkens waters verlooren loopen. Merckt noch dat ick de craen als aen G H (diemen seldom besicht als geseyt is) soo veroident heb, datmender niet dan met een sleutel by en can, en dit op dat vreemde lieden dieder<sup>45</sup> sonder kennis an mochten drayen, al 't water niet en doen verliesen. Hier boven is geseyt, den loyenback gestelt te zijn in een houten raem; Maer want het water, als dien back vol is, daer tegen met groot gewelt perst, en dat daerom 't selve raem wel sterck behouft te wesen, soo sal ick daer af mijn gevoelen stellen; te weten datment mach maken van vier stylen an malcander gehecht met gewuwsteerte ribben, van voet tot voet een, sulcx dat de gewelt der perssing niet alleen op nagels an en comme, maer oock op de selve wuwsteerten: Die ribben worden daer na van binnen becleet met plancken om het loot daer an te echten, en tegens te persen.

Hier vooren is geseyt van regenbacken onder d'eerde, uyt welcke het water inde suyverback comt, door een muerken van weyckbacksteen, maer sommige doet door sant syphen, 't welck beter en gesonder om drincken is, want alsoo worttet goet fonteyn water deur sant gesuyvert; De wyse van dien mach onder anderen aldus toegaen: A B C beteyckent den regenback of ontfanger; D E F den suyverback; G H een dichte traste muer tusschen beyden overcant gesien, die anden gront een overwelfde openheyt heeft. Van B tot C, van C tot F, en van F tot E is sant; van A tot B is onsuyver water, 't welck van B neerwaert sypende deur het sant tot C, en commende van C [ill. 29] tot F en van F opwaert tot E, deur het sant F E, ('t welck alsoo op commen can om dattet water A dan hoger is) soo ist van E tot D gesuyvert water.

Dese wyse van suyveren deur sant, en soudemen niet alleen mogen doen in trastbacken onder d'eerde, maer oock boven der eerde, stellende nevens den loyen trechtersen regenback, van gedaente als vooren, noch een suyverback

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<sup>44</sup> Erroneously: 'verswynis'.

<sup>45</sup> Erroneously: 'deider'.

It should also be noted that if this cistern is not built underground in the normal fashion but is placed above, it has the advantage of not requiring [the water] to be drawn in buckets, or raised with pumps, as elsewhere, and is always available to be drawn from the tap. But since a person may in everyday use leave the tap N open through carelessness, so that all the water or much of it flows out of the cistern, a lead container can be placed above it, to be filled from a separate tap, from which may be drawn with another tap, as long as the water remains in the same container, because then the aforementioned cleansing is completed. In that way only the water in the separate container can be wasted.

Note that I designed the tap G, H (which as stated is seldom used) in such a way that it can only be accessed with a key, because strangers who might turn the tap unwittingly, could waste all the water. As stated above, the lead cistern should be placed in a timber frame. However, because the water exerts great pressure when the cistern is full and because a strong frame is therefore needed, I shall state my opinion on this, that is to construct four struts joined with dovetailed joists, one for each foot, so that the force of the pressure comes not only on the nails, but also on the dovetails. These joists are then covered with planks to fasten to the lead and press against it.

Underground cisterns were referred to previously, from which the water flows into the water filter through a wall of porous bricks. However, some people let it trickle through sand, which is better and more healthy to drink, because good spring water is cleansed with sand;<sup>17</sup> Their method is for example as follows: A, B, C represent the cistern or reservoir; D, E, F the water filter; G, H an intermediary wall laid with trass seen from the side, with an arched opening on the ground. Between B and C, between C and F, and between F and E is sand; between A and B is dirty water, which drips down from B through the sand to C, and flows from C [ill. 29] to F and up from F to E, through the sand at F E (it flows up because the water at A is higher) so that between E and D the water is cleansed.

This method of cleansing through sand can be used not just in underground trass cisterns, but also above ground, placing the lead funnel-shaped cistern, as described above, together with the water filter described above, to

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<sup>17</sup> For this passage see Beeckman's commentary in 'Journael', fol. 230v lines 21-24.



als geseyt is, om also het water noch suyverder te hebben, niet liggende inden regenback op een slyckigen, stynckenden gront, gelijckt anders toegaet, oock om niet te moeten pompen of putten. De muer H G is overcant gesien, maer op haer plat gesien, verthoont haer als I K L M onder met een overwelft gat als N.

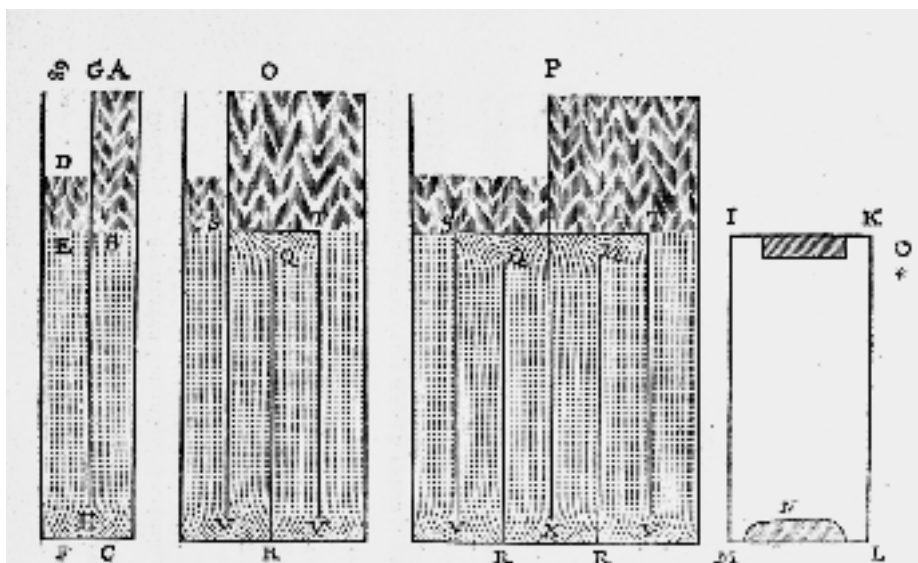
Die 't water deur meer sant wilde doen syten, soude verscheyden trasten mueren mogen doen maken, als met O en P aengewesen wort, hebbende de mueren Q R op haer plat gesien een gat gelijck in I K L M het gaet onder I K, met een dicht decksel daer over als S T.

#### II.4 VAN DE HEYMELICKEN

H. Stevin, *Materiae Politicae*, Byvough der Stedenoirdening, pp. 91-95

Vande Heymelicken.

Want sommige heymelicken een vuylen stanck veroirsaken, niet alleen inde camers daerse staen, maer oock deur 't geheel huys, sommige geen met allen, soo isser tusschen de Boumeesters verschil van haer plaets: Eenige veroirdenen die inde camers, ander buytens huys inden hof; ettelicken tot beyden plaetsen: Buytens huys is wel goet om den stanck binnens huys niet te hebben, maer ongerievich derwaert te moeten gaen deur regen, hagel, snee, storm en onweer; Ia in schoon weer ist ongelegen voor siecke lien die hun camer moeten houden; Oock ist onbequaem, dattet huys des nachts niet volcommelick gesloten en



ill. 29

make the water even more clean, since it does not remain in the cistern with the muddy malodorous soil, as otherwise, and does not have to be pumped or drawn up from the well. The wall H, G is seen from the side, but in profile is indicated with I, K, L, M with an arched opening N below.

To allow the water to filter through more sand, make several trass walls, as indicated in O and P, with the walls Q, R shown in profile and an opening as in I, K, L, M [the water] goes under I, K, with a sealed lid at S, T.<sup>18</sup>

#### II.4 ON PRIVIES

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 91-95

#### On Privies

Since some privies cause a foul stench, not only in the rooms they stand in, but throughout the house, while some make no smell anywhere, there is disagreement among architects regarding to their place. Some locate them in rooms, others outdoors in the courtyard; many in both. Outside is good since it avoids the stench indoors, but it is inconvenient to have to go there in the rain, hail, snow, storms and bad weather; in good weather it is also inconvenient for the sick who have to keep to their rooms. It is also awkward because the house

<sup>18</sup> In a subsequent note Hendrick Stevin mentions that he does not entirely understand his father's method and offers an alternative on the next page. See Appendix E. Notes on the unfinished Huysbou, p. 495: H. Stevin, *Materiae Politicae, 'Byvough der Stedenoirdening, 9 hooftstick'*, pp. 90-91.

mach blyven, maer datmender een uytganck moet laten voor ygelick des huysgesins, die daer te doen heeft of seght (al en waert so niet) te doen te hebben. Angaende datmen inde huysen sonder heymelicken gebout zijnde, kackpotten gebruyckt, die dickwils uytgedregen worden, dats een vuyle manier, en maeckt oock stanck inde camers, soo wel te wyle de vuylicheyte daer blijft staende, als int uyt dragen, welke stanck wel langer daer na geduert. Met heymelicken inde camers veroirdent en heeftmen de voorschreven ongerieven niet, maer het ongeluck van stanck crygende, 't is somwijlen onverdragelick.

Angaende mijn gevoel op dit geschil, dat is my best te bevallen heymelicken binnens huys, die niet en stijncken, gelijcker veel gevonden worden. Om tottet veroirdenen van sulcke te commen, soo salt oirboir zijn eerst te letten op de voornaemste oirsaken van die stijncken, welke dese zijn:

Ten eersten heymelicken met drooge gronden, als geplaveyt wesende, en die te ondiep gedolven zijn.

Ten tweeden buysen van sachtsteen, waer in oock achterdeel doet haer cromheyt en onevenheyt daer den stront op blijft liggen.

Ten derden heymelickhuyskens met haer ancleven, als brildecksels, deuren en veinsters niet behoorlick veroirdent wesende.

Ten vierden ingewant van visch, coninen, gevogelte en ander vuylicheyte, die in sommige heymelicken geworpen wort.

Ten vijfdem heymelicken deur welckers brillen de windt comt.

Ten sesten heymelicken daer de Son tegen de buyse schijnt.

Om nu te verclaren hoe dese swaricheden connen voorcommen worden, soo sal ick op elcke mijn gevoelen seggen.

Ten eersten salmen den put seer diep onder het quelmwater graven, het sant of d'eerde onder water uythalende sonder hoosen, met baggaerthaken of al boorende, gelijckmen de bornputten boort. d'Oirsaeck des voordeels van sulck putten is dusdanich: Het regenwater op d'eerde vallende, en daer deur sypende tot opt quelmwater, ververscht dat geduerlick, commende alsoo ander quelmwater in plaets vant voorgaende, welke verversching noch opentlicker te mercken is, deur dien tot veel plaetsen in langduerich nat weer sulck water seer hooch is, maer in lange drooge somers soo leege datmen tot ettelicke oirten, als in Zeelandt en elders, swaricheyt heeft om met delven daer an te geraken. Dit verstaen sijnde soo is vorder te aenmercken, dat stront in 't water dun en vlietich wort, welck haer mettet voorschreven quelmwater vermengende, daer me geduerelick onder d'eerde verspreyt en den stanck doet verdwynen. Hier af dient noch tot naerder prouwe dat inde legers den stront opt schijtvelt met groote regen soo verdwynt, datter daer na geen stof van dien gesien en wort, noch stanck geroken. Sulcke putten hebben oock het voordeel datmense niet ruymen en moet gelijck ander, mits welverstaende datmender geen vuylicheyte in en worpt, die in 't water niet vlietich en wort: Noch machmen gedencken

cannot remain completely locked at night and an exit has to be left for anyone in the family who has business there or says (even if this is not the case) that they have. Concerning houses built without privies where chamber pots are used, which are regularly brought outside, this is a filthy method and it makes a stench in the rooms, both while the filth is still there, and when it is carried out, while the smell lingers long after. With privies placed in the rooms this unpleasantness is avoided, but if it should unfortunately start to smell, it can become unbearable.

Regarding my own feeling on this question, I prefer indoor privies that do not smell, many of which have been devised. To determine how to design these, it is advisable first to examine the main causes of these smells, which are as follows:

- Firstly, privies with dry soil, which are paved, and which are dug too shallowly.
- Secondly, pipes of soft stone, in which their crookedness and unevenness is also a disadvantage since excrement remains there.
- Thirdly, privy enclosures where accessories such as toilet lids, doors and windows are not properly designed.
- Fourthly, innards of fish, rabbits, fowl and other rubbish that are thrown into some privies.
- Fifthly, privies where the wind blows through the toilet seats.
- Sixthly, privies where the sun shines on the pipe.

To explain how these problems can be avoided, I will first state my own views on each of these. Firstly, the pit should be dug deep below the water table, extracting the sand or earth below water level without scooping it out, but with dredging hooks or drilling, as a well is drilled. The advantages of cesspits like these are as follows. The rainwater that falls on the earth and permeates through it to the groundwater continually replenishing it, as new groundwater replaces the old. This replenishing can clearly be seen in many places where the water table is high during extensive wet weather, but so low during the long dry summers that in many places in Zeeland and elsewhere, it is difficult to reach. This being understood it should also be noted that in water excrement becomes thin and runny; mixed with the aforementioned groundwater, it disperses below ground and the stench disappears. Further proof of this is that in army camps excrement on the dung heap disappears in heavy rain, so that afterwards no trace of it can be seen and no smell remains. Another advantage of cesspits like this is that unlike other kinds they do not need to be cleaned, provided no rubbish is thrown in them which does not dissolve in the water.

hier toe behulpich te zijn, als men het regenwater vande daken deur gooten in dese putten doet loopen; Oock dat de heymelicken haer pompen hebbende tot gerief vande camers (welckers putten niet soo diep en moeten gegraven worden, als die der heymelicken) hier mede de vuylicheyte des stronts, soo dickwils ververst can worden als men wil; Ia men can met genouch te pompen, maken datterinde put geen stront en sy, maer alleenlick claer water sonder stanck.

Deur 't gene ick tot hier toe vande putten geseyt hebbe, is te verstaen dat stynckende heymelicken uyt oirsaeck van drooge putten, gebetert connen worden, met die te ruymen en dieper onder het quelmwater te delven.

Angaende de buysen der heymelicken, wanneer die gemaect syn van sacht backsteen of ander dat met stront en pisse deurweyckt, soo geven sulcke mueren binnens huys staende een stanck van haer (al en quamer geen uyt de put) diemen dickwils meest gewaer wort in dojende en regenachtich weer, en dat voornamelick van heymelicken diens brillen op bovecamers commen, waer af de buysen langer vallen als van die leeger staen. Maer dattet sachtsteen daer af alsoo deurweyckt, blyckt in veel gevels die ter plaets daer de buyse tegen comt, een ander vuyle verwe hebben dan daer nevens. Het streckt oock tot vermeerdering des stancx; als de stront hoge inde buyse vergaert, oock mede als daer cromten of onevenheden in syn daerse op vergaert. Om dese swaricheyte te voorkomen, soo ist goet de buysen van hart steen te maken, als gebacken kleynckaert, of gehouwen clupsteen, of van weycksteen zijnde, die van binnen soo met loot te besetten, oock soo recht en sonder onevenheden te maken, datter sulck ongeval niet af en komme.

Om nu vande heymelick huyskens te seggen, soo is te weten dat in sommige camers met heymelicken, geen huyskens en zijn, maer is de setel gemaect in een besloten banck, daer af het decksel over de bril commende open en toegaeet als van een kiste, sonder uysterlick te schynen datter een heymelick is; Ander setels staen inde muer ontrent  $11\frac{1}{2}$  voet diep, met een deur voor het hol en oock sonder huysken. Nu hoewel sommige sulcke heymelicken niet meer stancx inde camers en brengen dan offer geen en waren, nochtans angesien ander gebreck daer af hebben, en bovendien ombetaemlick is, dat de gene die daer op sit, van ander inde camer zijnde, connen gesien worden, soo ist oirboir vande huyskens te seggen. De selve soude ick begeeren, niet van hout maer met steene sijdmueren, boven overwelft, of alsser een houten solderken op comt, geplestert: Voort dat op den bril comme haer decksel, en voor de holle sitplaets een deur, sulcx dat met de deur vant huyskens, den stanck tot drie plaetsen uytgeslooten is: Noch vereyscht de holle sit plaets haer besonder veinster, en het huysken de hare, uytcommende inde vrye locht, niet binnens huys, en soo dat men die tewyle daer niemant in en is, mach laten openstaen, maer toedoen als men wil, voornamelick te wijlmen in cout windich weer syn gevouch begeert te doen.

Moreover, it is helpful to ensure that the rainwater from the roofs flows into these cesspits along gutters. The pumps of the privies are also attached to the convenience of the rooms (whose cesspits should not be dug as deep as those of the privies) enabling the filth of the excrement to be disposed of as often as required; it is possible to ensure, by pumping sufficiently, that no excrement remains in the cesspit, just clean water without any stench.

From what I have stated here about cesspits, it should be clear that privies which smell due to the cesspits being dry can be improved by digging deeper and wider below the water table.<sup>19</sup>

Regarding pipes in privies, when these are made of soft brick or other material that becomes permeated with excrement and urine, indoor walls like these give off a smell (even if this is not from the cesspit) that is most noticeable when it rains or thaws, and that generally derives from privies with seats in upstairs rooms, since these pipes are longer than those that are lower. The porosity of soft stone is evident in many façades, from the comparatively filthy colour where the pipe touches. More smells also result if the excrement accumulates in the pipe, and if there are bends or twists that cause it to accumulate. To overcome this problem, pipes should be made of hard stone, such as fired clinker, or hewn rock, or if of soft stone, to cover this with lead on the inside and to make them straight and without irregularities, to ensure it does not lead to this kind of unpleasantness.

When discussing privy cubicles, it should be noted that some rooms with privies have no cubicles, although the seat is in a closed bench, with the lid above the seat opening and closing like that of a chest, without it being obvious from the outside that it contains a privy. Other seats are set in the wall about one and a half feet deep, with a door in front of the opening and also without a cubicle. Although some privies cause no more stench in the rooms than if there were none at all, they do have another disadvantage, one that is unseemly, moreover: that a person seated here can be seen by anyone else sitting in the room.

So it is important to discuss cubicles. I prefer these not to be made of timber but with stone walls and arched over or stuccoed if the ceiling is wooden. Moreover, a lid is required to cover the seat, and the hollow seat should have a door, so that together with the cubicle door, the smell is held back at three stages. The hollow seat also requires a separate window and the cubicle its own giving onto the open air – not indoors – so that it can remain open while unoccupied, or closed if preferred, generally when people have to do their business in cold blustery weather.

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<sup>19</sup> For this passage see Beekman's commentary in 'Journael', fol. 230v lines 25-28. See also 194r lines 21-24 in Appendix E, p. 487.

Belangende den stanck der heymelicken veroirsaeckt deur ingewant van vis, coninen gevogelte en ander sulcke vuylichey, die in 't water niet vlietich en wort, daer ingeworpen sijnde deur onachtsaem cocx of dienstboden, te luy wesende 't selve buytens huys te dragen, dat can gebetert worden met de put te ruymen, oock soot nodich is, dieper onder het quelmwater te graven, en voort toe te sien dattet inworpen van soodanige ontycheyt daer na niet meer en gebeurt.

De reden waerom den stanck van sulcke vuylichey walgelicker is dan van stront, machmen mercken inde legers, alwaer doode lichamen van menschen en beesten, veel ysselicker en onverdragelicker styncken, dan den stront opt schijtveld, oock en vergaet die stanck soo haest niet deur regen, om dat de stof daer me niet vlietich en wort, noch soo en verspreyt als d'ander.

Tis quaet dat uyt een heymelick deur den bril wint comt om twe redenen, d'een dattet in windrich weer ongesont en onbequaem is op sulcke heymelicken te sitten: Ten anderen dat de stynckende wint daer uyt commende, het huys met stanck vervult. Dese wint door de bril commende, geschiet om twe oirsaken. d'Eene alser twe of meer heymelicken op een put commen, sulcx dat den wint deur d'een incommende, deur d'ander uytvliecht; Dit ongeval canmen voorcommen, mettet onderste der buyse van elcken bril soo leegh te brengen, dattet altijt onder water sy. d'Ander oirsaeck is dat sommige lochtgaten maken, om daer me de stanck te verminderen, voor welck misverstant men sich wachten moet, want vermindering des stanck inde put met vermeerdering des stanck in huys is schadelicke mangeling.

Heymelicken daer de Son tegen de buyse schynt hebben in heet weer een swaren stanck om bekende redenen, want de stront warm wordende &c. Als doeyt stijckense oock om redenen.

## II.5 VANDE KELDERS

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 95-98

Kelders syn tot verscheyden saken der huyshouding seer dienstelick, want die swinters warm wesende, sonder vorst, soo syn Bier, Wijn, Broot, Asyn, en ander vochticheden die deur den vorst verderven, daer in versekert: 't Somers wort de spijs daer lange in verwaert sonder styncken, den dranck coel sonder versuyren: Voort sijnt bequame plaetsen, om daer in te leggen coomschappen of goeden die vochticheyt lyden mogen of vereyschen, oock branding als turf en hout, wastobben, leedige vaten, en ander noodigen huysraet die haer bedeckte plaets behouven. Drooge diepe kelders, connen oock dienen om t'somers eenige uyren sdaechs daer in te vertrecken, geduerende de groote

Regarding the stench in privies caused by innards of fish, rabbits, fowl and other rubbish which does not dissolve in water, thrown in by careless cooks or servants, being too lazy to take it outdoors themselves, this can be resolved by making the cesspit wider and, where necessary, digging deeper below the water table, and then ensuring that this kind of rubbish is no longer thrown there again.

The reason why the stench of this sort of rubbish is more loathsome than that of excrement is evident in the army, where corpses of men and animals smell much worse and appalling than the excrement on the dungheap, while the stench is hardly removed when it rains since this does not dissolve or disperse like the other substance.<sup>20</sup>

If the wind blows through the seat of a privy this is unpleasant for two reasons. Firstly, because in windy weather it is unhealthy and uncomfortable to sit on a privy like this; secondly, because the foul-smelling air that issues fills the whole house with the stench. The wind blowing through the seat, has two causes. Firstly, when two or more privies are dug above one cesspit, the wind entering through one blows out through the other. This can be resolved by making the lower end of the pipe of each seat so low that it is constantly submerged in water. Another cause is the flues some people build to reduce the stench – a mistake which should be guarded against, because it is a poor exchange to reduce the stench in the cesspit but to increase it in the house.<sup>21</sup>

Privies where the sun shines on the pipe smell bad in warm weather for obvious reasons, because the excrement becomes warm etc. When it thaws they also tend to smell.

## II.5 ON CELLARS

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 95-98

Cellars are useful for various household tasks, since being warm in the winter and free of frost, beer, wine, bread, vinegar and other liquids that are harmed by frost, are preserved. In the summer spices can be kept there for long periods without smelling, drink remains cool without going sour. Moreover, these are convenient places to store commodities or goods that may suffer from or are affected by damp, also fuel such as peat and wood, washtubs, empty casks, and other necessary household items that require a covered storage place. Dry deep cellars, can also serve in the summer to retire to for certain hours of the day, during any great and fearsome heat. The floors of the rooms above the

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<sup>20</sup> For this passage see Beeckman's commentary in 'Journael', fol. 230v lines 29-30.

<sup>21</sup> For this passage see Beeckman's commentary in 'Journael', fol. 230v lines 31-33.



bange hitte: De vloeren der camers commende op de overwelfs syn drooch en gesont, daerse anders sonder kelders gemeenlick vochtich zijn. Ansiende al dit groot gerief, ick soude een huysing t'eenemael op kelders begeren, en dat noch om twe voornamelicke redenen. Ten eersten als men alleenlick onder een perck een kelder maeckt, de camer daer boven commende, is ongeschicktelick, wat hooger als d'ander nevenstaende percken, die op geen kelders en staen: Ten tweden gebeuret gemeenlick dat men om branding, ledige vaten, en ander rammeling in te leggen besonder achterhuysing maeckt, met verlies van erve en dickwils van meerder cost dan de kelders syn souden. Om nu te seggen vant maecksel, mijn gevoelen is daer af dusdanich. Al condemen in d'eerde seer diep graven sonder water te ontmoeten, soo soude ick nochtans den ondercant der overwelfsels, altijd ontrent 2 1/2 of 2 voet hooger dan de straet begeren, eensdeels om daer deur vrylicht inde kelders te crygen, ten anderen dat de camers daer boven commende, soo hooch zijn, dat men van op de straet niet sien en can watter ingedaen wort, connende nochtans de gene die inde camer syn al sien wat men op straet doet. Wyder valt hier te anmercken dat kelders, in leege landen gebout, dickwils het ongerief hebben van met hooge wateren nat te worden, sulcx dat mense dan niet bequamelick gebruycken en mach: De middel om daer tegen te voorsien, is drierley; Ten eersten dat men se maeckt van clynckaert en trast, doch heeft dit sijn ongeval, dattet splytende of eenige ondichticheyt crygende, 't water daer deur comt en somwylen quaet om stoppen is, voornamelick als den vloer diep int water licht met stercke perssingh: 't Gebeurt wel als men sulcken leck niet stoppen en can, dat mender een traste buyse rontsom metselt, soo hooch als genouch is, om het hoochste water te vervangen, maer 't is al onbequaem werck. De tweede wijse is onlancx t'Amsterdam int gebruyck gerocht alwaer seer leech lant zijnde, maken het deel onder water commende, van hout stoppen dat met mos en teer, en onderhouden gelijk men de Schepen doet. De derde wijse, die de sekerste is, gaet aldus toe: Genomen een landt seer leech te wesen, dattet water, ten hoochsten zijnde, daer op comt, in sulcken gevalle moeten de straten gehoocht zijn, om daer op drooch te mogen gaen, daerom soude ick die verhooging doen van 4 voeten boven het hoochste water (welverstaende alst om ander oirsaken niet en moest gelaten zijn) daer na de leufvloer of stouplaets voor het huys noch een voet hooger, dan de voorschreven straet, comt t'samen 5 voet, en de overwelfsels der kelders, om de voorgaende redenen noch 2 voet hooger, comt in als seven voeten, t'welck genouch is om vryelick in overeinde te mogen gaen, en dit alles sonder eenige bedwongen oirden. Vyt het gene ick hier geseyt heb, is te verstaen dat wannermen int landt een voet diep mach graven, eermen ant hoochste water comt, soo soudemen de straet alleenlick 3 voeten moeten verhoogen, en noch min als men dieper graven mach.

vaulting are dry and healthy, where they would normally be damp without a cellar.

In view of their considerable convenience, I prefer a house to be entirely on cellars for two main reasons. Firstly, if a cellar is made under only one section, the room above is higher than the adjoining rooms that are not built on cellars, which it is unsuitable. Secondly, people generally build a separate back aisle to store fuel, empty casks and other odds and ends, with a loss of space and often at more expense than a cellar would be.

With regard to how they should be built, my views are as follows. Even though it is possible to dig deep without striking water, I would still prefer the bottom of the vaulting to be about two and a half or two feet above street level, partly to allow light to enter the cellars, partly because the rooms built above them would otherwise be so high that it would be impossible to see what was going on inside from the street, or for those in the room to see what was happening in the street. Furthermore, cellars built in low-lying countries often have the added inconvenience of being flooded during high waters, so that they cannot be comfortably used. There are three ways to combat this. Firstly, by making them of clinker and trass, although this has a drawback – if it splits or a leak occurs, the water enters through and is hard to stop, especially when the floor lies deep below the water table where the pressure is enormous. Sometimes, a leak proves so difficult to stop that a trass pipe has to be built around it, as high as necessary to accommodate the highest flood, although this is an awkward device. The second method was recently used in Amsterdam where the ground is low: caulking the part that remains below water with wood and preserving it with moss and tar as with ships.<sup>22</sup>

The third and safest method is as follows. In a low-lying region which floods when the water rises to its highest level, the streets should be made higher, so that people can walk on them and remain dry. I would therefore raise it four feet above the high water mark (assuming there are no other reasons why this cannot be done) and raise the gallery or stoop in front of the house a further foot above the aforementioned street, together making five feet, and the vaulting in the cellars, for the stated reasons another two feet higher, making seven feet, which is enough to enter freely while standing upright, and all this without any discomfort. From what I have stated here it should be noted that where it is necessary to dig a foot into the ground before reaching the high water table, the street needs only be raised by three feet, and less if the water table is deeper.

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<sup>22</sup> For this passage see Isaac Beeckman's commentary in 'Journael', fol. 231r lines 1-3.

Merckt noch dat, al licht den gront van kelders hooch genouch sonder water daer in te commen, soo ist nochtans oirboir die metsgaders de sijdmueren van clijnckaert en trast te maken om daer uyt te houden alle deurwasemende vochticheyt, die 't broot, vleesch en ander dingen haest doen verschimmelen, en sieckten veroirsaken voor de gene dieder in woonen.

Angaende overwelfsels diemen billichlick voor gedeelten van kelders hout daer af sal ick seggen inden Huysbou, alwaer vande overwelfsels int gemeen sal gehandelt worden.

It should also be noted that, even if the cellar floor is high enough and no water pours in, it is still advisable to build the walls with clinker and trass to keep out penetrating damp, which may cause bread, meat and other things to go mouldy, and lead to disease among those who live there.

Regarding the vaulting appropriate for parts of cellars, I shall discuss this in *Huysbou*, in which vaulting in general will be discussed.<sup>23</sup>

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<sup>23</sup> See Appendix E, Notes on the unfinished Huysbou, p. 495: H. Stevin, *Materiae Politicae*, 'Byvough der Siedenoirdening, 9 Hoofstick', p. 98.

# III Vande gevels

## III.1 VANDE FREYTEN DER GEVELS

Isaac Beeckman, 'Journael', fol. 231r lines 4-5

De freyten sullen van binnenshuys aen de gevel komen van onder tot boven tusschen de veynsters. Onder dickst.

## III.2 VAN DE DEUREN EN VEYNSTERS, DIE IN DE GEVELS COMMEN

- Van de stof der cassynen van deuren en veinsters met die der luycken  
H. Stevin, *Materiae Politicae, Byvongh der Stedenoirdening*, pp. 119-120

Hoewel het openbaer genouch mocht schynen, dat in stene gevels vereysch worden steene cassynen, te meer datment in veel landen overal soo doet, nochtans gemercktmen nu ter tijt hier in Hollant, deur een quaet out gebruyck, houten cassynen stelt, soo moet ick hier vermaen doen van haer gebreecken. Ten eersten houten cassynen geraken door regen, vorst, en sonneschyn haest te splyten, in te wateren, te verrotten en haer leelick te verthoonen int gesicht. Ten tweden want hout en steen an malcanderen niet vereenicht, soo worden de cassynen die int eerst tegen het steen anquamen, corts daer na af te wijcken, deur het indrogen der mortel ter eender, en 't hout ter ander zijde, sulcx dat ter openheden tusschen beyden geraken, een duym breed en meer, daer wint en coude deur comt: En hoewel dat met tegelsticken en mortel toe gestrecken wordende, voor eerst dicht is, ten duert niet lange, soo omt geduerich slaen der luycken tegen de cassynen, als van wegen vorder drooging, oock staet sulcke stopping lelick int gesicht. En hoewelmen in gevels die dick genouch zijn, dit eenich sints voor comt, stellende de cassynen ontrent 2 duymen diep int steen, nochtans crygense ondichticheyt van binnen tusschen het hout en steen,

# III On façades

## III.1 ON BUTTRESSES IN FAÇADES

Isaac Beekman, 'Journael', fol. 231r lines 4-5

The buttresses link the façade to the house from top to bottom between the windows. Thickest below.

## III.2 ON DOORS AND WINDOWS IN FAÇADES

On the subject of frames for doors and windows and on shutters<sup>24</sup>  
H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 119-120

Because timber frames are still used in Holland today - thanks to bad and outdated usage - although it should be generally known, especially since this is how it is done in many countries, that brick<sup>25</sup> façades require stone frames, I shall warn about their defects.<sup>26</sup> Firstly, rain, frost and sunshine can cause timber frames to split, become waterlogged, rotten and distorted. Secondly, since timber and brick are not easily joined, frames that initially touch the brick subsequently distort as the mortar dries out at one side and the wood at the other, so that openings appear in between, an inch or more wide, allowing draughts and cold to enter. Even if it is smeared with tile paste and mortar before it is first sealed, this does not last long, due to the constant slamming of the shutters against the frames and the continuing dehydration; moreover, this type of filling has an unattractive appearance. And although frames may be inserted about two inches into the brickwork in façades that are thick enough, these

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<sup>24</sup> After describing how to build a building to ensure against fire, Hendrick Stevin adds this passage about frames and windows that he states really belongs to the section on façades.

<sup>25</sup> The Dutch word 'steen' is used as a synonym for 'baksteen' and can mean brick as well as stone; here the walls are presumably of brick, and the window and door frames of stone.

<sup>26</sup> For this passage see Beekman's commentary in 'Journael', fol. 231r lines 10-11.

makende winderige camers en cranck werck. Ten derden de cassynen droogende en cromtreckende, de luycken en passen daer niet in, commende wint en coude door gesloten veinsters. Maer de sponden der hartsteene cassynen wel recht gevrocht en effen geslepen zijnde, blyven recht met dichter sluyting der luycken en schoonder int gesicht.

Hier syn wel verscheyden mans die in haer gevels geeren steene cassynen soudou veroidnenen, dan sy moeten van hout zijn, om vrede te hebben met haer wijfs, die de binnesijde geduerelick doen boenen, datse blyncken: Maer haddense elders gesien, datmen veel schoonder blynckende steen vint dan hout, 't mocht syn datse van sin veranderde.

De steene cassynen hebben wel een gebreck, dat het roest der yser duymen daer de luycken op drayen, metter tijt soo dick vergaert, dattet de steenen daer sy angegooten syn doet splyten, maer stellende coper duymen in plaets van yser, soo wort daer me de swaricheyt voorcommen.

Angaende de stof der luycken die en is, om tegen dieven wel verseeckert te wesen, niet bequaem genouch van hout, wantmen daer deur inder nacht stillekens gaten booren can daermen een arm deur crycht, om de binnegrendels te openen: Hier tegen schynen bequaem de yser luycken, gelijk in verscheyden Steden gebruyckt worden, als binnen Craco in Polen, daer my gedenckt gesien te hebben verscheyden grooten huysen, diens veinsters yser luycken hadden. Serlius spreeckt van coper.

– vande verscheyden manieren vant open en toegaen der luycken

H. Stevin, *Materiae Politicae, Byvongh der Stedenoirdening*, pp. 121-122

De manier van 't open en toegaen der luycken vande veinsters die gheschiet op twederley voornamelicke wijzen; d'een sijdeling, d'ander van boven neerwaerts, of van onder opwaerts, of het een deel van boven neerwaert, het ander van onder opwaert.

Die sijdeling open gaen hebben eenighe onghewallen: Ten eersten, datse in storm groot gerucht maken, gheduerelick open en toe gheslegghen worden, ter eender sijde teghen de cassijnen, ter ander sijde teghen den ghevel, sulcx datse de cassijnen en haer selven ontsetten en breken, of by aldiense in 't open gaen niet plat teghen den ghevel en slaen, maer teghen een cant ancommen, soo breeckense daer op te lichter. 't is wel soo dat eenighe, om sulcx te voorcommen, ghebruycken wervels of haken daer me sy die vast stellen; maer 't selve niet telckens bedocht sijnde, ghelijck 't lichtelick ghebeurt in schoon weer, daer onverhoets een storm na comt, soo volgther het voorschreven onghewal. Ten tweden, wanneer tusschen twe cassijnen niet soo veel muers en is als de brede van twe veinsters bedraecht, soo slaen de luycken mette stormen teghen malcander in stucken; maer soo veel muers tusschen beyden wesende, datse

are still not weatherproof on the inside between the wood and brick, resulting in draughty rooms and shoddy workmanship.<sup>27</sup> Thirdly, when the frames dry and start to warp, the shutters no longer fit, so that draughts and cold enter through closed windows. But the grooves in stone window frames, provided these are made straight and evenly smoothed, remain flush, the shutters closing more firmly, while these also appear more attractive.

However, while many here would like stone frames in their façades, they nevertheless make do with timber in order to live in peace with their wives, who continually polish the inside till it shines. Yet had they seen stone elsewhere that shines even more than wood, they might have changed their minds.

Stone frames have one defect, that the rust on the iron hinges on which the shutters turn, can in time become so thick that it causes the stones into which they are cast to split. If bronze<sup>28</sup> is used instead of iron, the problem is solved.

Regarding the material of the shutters, timber does not provide sufficient protection against thieves, since holes can be quietly made at night allowing an arm through, to open the bolts on the inside. Iron shutters seem an effective way to prevent this, as found in various cities, like Cracow in Poland, where I remember having seen various large houses whose windows had iron shutters. Serlius mentions bronze.

On different ways to open and close shutters

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 121-122

There are two main ways of opening and closing shutters; one is sideways, the other down from above, or up from below, or one part down from above and the other up from below.

Those that open sideways have certain drawbacks. Firstly, they make a loud noise during storms, constantly rattling open and shut, on one side against the window frames and on the other against the façade, so much that they can dislodge or break both the frames and themselves, or when they swing open, instead of hitting flat against the façade they strike a corner breaking up even more easily. Certainly, to prevent this, some people use fasteners or hooks to tie them; but if these are not constantly remembered, it may easily happen in fine weather that a storm unexpectedly occurs, resulting in the aforementioned misfortune. Secondly, when the wall between two frames is less than the width

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<sup>27</sup> For this passage see Beeckman's commentary in 'Journael', fol. 231r lines 12-14. The passage also mentions the glass in windows, stipulating that it should be set back an inch.

<sup>28</sup> The Dutch word 'koper' is used as a synonym for its alloys and can mean bronze as well as copper; here the intended metal is presumably bronze.



malcander niet gheraken en connen, soo moeten de camers weynich licht hebben. Ten derden, sulcke luycken neven en na by deuren commende, hebben die onbequaemhey, datse open staende, ten deele het gat vande deure bedecken, met verhinderung vande gene die daer in en uytgaen. Ten vierden, op de straet sijde sulcke luycken by der eerde staende, sijn sorghelick voor de lieden die by doncker daer teghen loopen, waer af het ongheval soo groot bevonden wort, dat in sommighe Steden keuren ghemaect sijn van sulcke luycken niet te moghen stellen, dan op een sekere hoochde boven der eerde. Ten vijfden, doen sulcke luycken verhinderung ant sijdeling uytsicht.

Maer luycken die van boven neerwaert of van beneen opwaert open en toegaen, en hebben die voorschreven ongevallen niet, te weten datse in storm open staende niet en beweeghen, maer vast blijven: Al is tusschen twe cassijnen luttel muers, sy en commen in 't open gaen malcander niet te gheraken: Oock moghen de camers daer me veel licht hebben: Als sy nevens en na by deuren staen, sy commen daer niet voor met verhinderung van de ghene dieder uyt en ingaen: Soodanighe luycken op de straet sijde byder eerde open staende, en doen geen verhinderung, an de ghene die by doncker langs de straet gaen, sulcx dattet niet noodigh is voor soodanighe luycken stadtkeuren te maken: Oock en doense gheen verhinderung ant sijdeling uytsicht: Daerenboven dienense om in winckels op te stellen cramerije en ander goet: 'tis wel waer dat groote sware luycken t'eenemael opwaerts of t'eenemael neerwaert open en toegae-nde, d'onbequaemhey hebben, dattet moeyelick valt die open en toe te doen, om haer gewichts wille; maer dat wort voorcommen, als men het leechste deel van boven neerwaert en het bovenste deel van beneen opwaert doet open en toegaen, want elck deel dan cleen wesende, en kan niet veel gewicht by brengen: Sy hebben oock een gherief dattet bovenste deel een bequaem deksel of schutsel is teghen reghen en sonneschijn voor de ghene die inde veinster legghen: Of andersints soudemen het bovenste deel staende licht connen laten blijven dat men niet open en doet.

– vant sluyten der veinsters

H. Stevin, *Materiae Politicae, Byvongh der Stedenoirdening*, pp. 122-124

Inde opengaende veinsters wort vereyscht sekerhey tegen dieven; oock om die van binnens huys te beletten van by nacht daer door heymelick uyt te gaen, of ander in te laten, alles streckende tot oneerlick einden: Voort wort vereyscht dichtighey teghen reghen, drijsnee, en wint: Maer want daer in als noch niet bequamelick genoegh en schijnt voorsien te wesen, soo sal icker wat af segghen.

Om te beletten dat de dieven deur de glasen der bovenste staende lichten niet en kommen, soo stelt men daer voor houtte luycken sijdeling open gaende

of two windows, the shutters break each other to pieces in storms; yet if there is enough wall between them so that they are unable to touch each other, then the rooms have little light. Thirdly, when these shutters are adjacent or close to doors, they suffer the disadvantage that, when open, they partly cover the door opening thus obstructing people going in and out. Fourthly, on the street side, shutters close to the ground are a hazard for people who bump into them in the dark, which is considered so serious a danger that in some towns bye-laws have been passed prohibiting these shutters, unless a certain height above the ground. Fifthly, shutters like these obstruct the view to the side.

But shutters that open and close down from above or up from below, do not have these drawbacks, namely they do not move when open during a storm, but remain stationary.<sup>29</sup> Even where there is little wall between two window frames, they do not touch each other when open; as a result of which the rooms also have more light. If placed adjacent or close to doors they do not open in front of them obstructing those going in or out. When close to the ground, shutters like this on the street side do not form an obstacle for people walking along the street in the dark, so that it is unnecessary to make bye-laws prohibiting these shutters. Neither do they obstruct the view to the side. Furthermore, in shops they serve to display merchandise and other wares. It is true that massive and heavy shutters that open or close up or down, have the disadvantage of being difficult to open or close, owing to their weight; but this can be avoided by opening and closing the bottom part down from up and the top part up from down, since each part, being small, cannot weigh much. This also has the advantage that the top part forms a useful cover or shelter against rain and sunlight for anything placed in the window. Or the upper part can be left in position and not opened.

#### On closing windows

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 122-124

Windows that open require some protection against thieves; also to prevent those inside the house from secretly leaving by them at night or letting others in with dishonest intentions. An additional requirement is protection against rain, snow and wind. But since this does not as yet appear to be effectively provided, I shall therefore discuss the matter.

To prevent thieves entering through the glass of the uppermost windows, shutters are placed in front of them which open sideways or down from above,

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<sup>29</sup> For this passage see Beeckman's commentary in 'Journael', fol. 231r lines 19-21.

of van boven neerwaert vallende die men blinde noemt; maer daer me sijn de camers, smorghens als men daer eerst in komt heel duyster, sonder datmen siet waer men gaet, en moeten die blinden by doncker, al tastende geopent worden, 't welck ongerievich is.

Angaende dat men om gheen blinde te ghebruycken inde staende lichten yser baren stelt, soo na malcander datter de dieven niet deur en connen, dat heeft oock sijn ghebreck, want een ruyt uyt ghenomen sijnde men cander den arm deur steken en de onderste luycken metter handt ontgrendelen en alsoo in comen: Hier teghen worden inde onderste opengaende lichten oock wel yser bare ghestelt, maer men can alsdan het hoofd uyt den veinster niet steken, om op straet te kijcken, 't welck ongherievich is. En hoewel men dit ongeval voorkomt met voor de veinsters uytstekende yser tralien te stellen, daer mede men sijdelinghs mach uytsien, soo sijn sulcke veinsters onbequaem voor huysen met winckels van neering, als tot coomschap of ambachten: Boven dien soodanighe huysen in brant wesende, die in sulcken camer met yser tralien of yser baren beslooten is, en cander niet uyt gheraken; welcke bedencking den sommighen, d'een meer als d'ander, in gheduerighe vreesse houden: Doch isser soo veel af, dat men daer door van binnens huys inder nacht niet en can uytgaen of anderen in laten. Maer om dit voordeel te ghenieten en d'ander swaricheden te voorkomen, dat can gheschieden mette opengaende veinsters, benevens haer ghewoonlicke grendels, noch te doen sluyten met een slot, opengaende mette sleutel des nachtslots van den voordeur, en dat sonder inde veinsters yser baren, yser tralien, of blinden te brenghen: maer alleenlick yser baren ande staende lichten: want de dieven door een ruyt al schoon metter hant ande grendels gherocht wesende, en connen dat slot niet open doen: In ongheval van brant, can men deur de veinsters uytgheraken: Het sijdeling uytsicht door de veinsters en isser niet verhindert: Sulcke veinsters connen soo wel dienen voor huysen van nering als voor andere: De duysterheyt deur blinden veroirsaeckt en valt hier niet.

Merckt noch dese sluyting der veinsters met een slot vereyscht te wesen, daer men wil ghebruycken deuren met nachtsloten (dat sijn diemen 't daechs kan open doen ghelijck ander, maer 's nachts niet sonder sleutel) want de gene die van binnens huys yemant heymelick willen in laten, of selfs uytgaen, dat connen doen door de veinsters, 't welck aldus niet gheschiet en kan, of men souder de nachtsleutel toe moeten hebben, die den huysvaer, of huysmoer of yemant diemense betrouwt, in bewaernis heeft.

Om seer dicht teghen reghen en wint te sluyten bevalt my beter dat de binnenste veinsters ghelijck de buytenste luycken sluyten in sponden der steene cassijnen en met yser of koper duymen daer an hanghende, dan dat die veinsters

called orbs. However, this makes the rooms dark when first entering in the morning, so that people cannot see where they are going and have to grope in the dark to open the orbs, which is inconvenient.

Where, to avoid using orbs, people fix iron bars in the windows, one under the other to stop thieves entering, this also has a disadvantage since by removing one pane an intruder can insert an arm and unbolt the lower shutters by hand and so gain entry. To prevent, this iron bars can also be placed in the lower serviceable windows, although it is then impossible to look out onto the street with the head through the window, which is inconvenient. And although this disadvantage can be resolved by placing projecting iron grids in front of the windows, providing a side view, these windows are inconvenient for houses with shops where merchandise or handicrafts are sold. Furthermore, if houses like these catch fire, anyone in a room that is closed with iron grids or iron bars cannot escape, the thought of which is a constant fear to some - some more than others. Although there is this in their favour, that people cannot get out of the house or let others in during the night. Nevertheless, it is possible to enjoy this advantage and avoid the disadvantages by closing serviceable windows with a lock in addition to the normal bolts, which can be opened with the key of the night lock of the front door, and this without introducing iron bars, iron grids or orbs in the windows, but only iron bars on the vertical windows, since even if thieves are able to reach the bolt through a window pane, they cannot open this lock. In case of fire, people can escape through the windows. The side view through the windows is not blocked. Windows like this can serve for shops as well as for houses. The darkness caused by orbs does not occur here.

Note also that where doors with night locks are used (i.e., which can be opened during the day as usual, but not at night without a key) these windows should be closed with a lock, since anyone inside the house who wished to let a person in secretly, or leave themselves, could [otherwise] do so through the windows, which would in this case not be possible without access to the key that the master or mistress of the house or some trusted person, had in their keeping.

To close tightly against the rain and wind I prefer the inside windows and outer shutters to fit into grooves in the stone frames, on which they are suspended with iron or bronze hinges, rather than that the windows are enclosed

sluyten in houten ramen, tot dien eynde in 't steen der cassijnen vast ghemaect, ende daer an hanghende met yser hengersels op 't hout ghenagelt. Ende op dat deur de garren der veinsters geen regen noch wint en komme, soo soude ick inde sponden houden noch een andere spond daer houte reghelkens in passen die men teghen de luycken en veinsters soude moghen naghelen.

– vande kijckveinsters

H. Stevin, *Materiae Politicae, Byvongh der Stedenoirdening*, pp. 124-126

De Keyckveinsters wel veroirdent sijnde, gheven groot gherief: Ten eersten om daer uyt na verscheyden oirten te sien, soo wel ter rechter en slijncker sijde als na beneen en voorwaert, sonder self ghesien te werden, dat onder anderen te passe comt, om alsmender klopt, te sien wiet is, eermen inlaet, en sich daerentusschen te bedencken, alst noot is, watmen die clopt antwoorden of segghen sal: Ten anderen canmender in reghenachtigh weer uytsien, sonder nat werden, in windrich vriesende weer, sonder de camer te vercouden, 't welck ghebeurt met ander veinsters diemen open moet doen.

Dese kijckveinsters worden ghemaect van steen, hout en yser; De steenen en bevallen my niet, want om behoerlicke sterckte te hebben, moetense den gevel seer beswaren. Angaende sommighe alsoo doen uytsteken niet alleen veinsters, maer oock cleene camerken die sy een vastigheyt gheven, niet op cardousen, maer recht neerwaert tot op de gront der eerde, dat en bevalt my niet om twee redenen: D'eerst datmen daer uyt niet recht neerwaert sien en can, sonder 't hoeft buytens huys te steken; Ten anderen datse het sijdeling ghesicht van d'ander nevenstaende veinsters beletten, 't welckmen behoort te schuwen, want het ghebeurt dickwils eenen niet te willen lijden, dat sijn nabuer uytstekende camers maeckt die het sijdeling uytsicht van sijn camers, winckel of voorhuys beletten, en over sulcx met hem in gheschil en ghepleyt gheraect; daerom die in sijn gevel uytstekende camerken maeckt, vanden gront opgebout, het ongherief dat hy van anderen niet lijden en wil, doet hy hem selven an, en dat onnoodich, sonder vrucht, want hy het sijdeling uytsicht krijghen can met sulcken yseren kijckveinster als hier na beschreven sal worden, die sijn eyghen nevenstaende camers noch sijn nabuers huys geen belet en doet.

Soo veel hout belanght, dat is tot kijckveinsters onbequaem om de redenen des 1 lidts deses 2 deels.

Daerom soude my hier toe beter bevallen ysere tralien alleenlick soo verre uytstekende als ghenouch is om sijdelingh en rechtneerwaert te connen sien; Ick neem 8 of 9 duym binnens cants, want te verre uytstekende, sy beswaren al me de gevel.

in timber frames, which are secured in the stone [outer] frames, suspended on iron hinges nailed to the wood. And to prevent rain and wind entering through the gaps in the windows, I would augment the groove with a second groove in which to fit strips of wood to be nailed to the shutters and windows.

On oriel windows

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 124-126

Oriel windows, if designed properly, are highly convenient. Firstly, to look through in different directions without being seen, to the right and left as well as down and straight ahead. It is useful when a person knocks, for example, to see who it is before letting them in, and if necessary to reflect on how to respond to the person who is knocking. In addition, a person can look out in rainy weather without getting wet, or in windy and freezing weather without the room getting cold, which is true of other windows that have to be opened.

These oriel windows are made of stone, timber and iron. I disapprove of the stone ones because; to be of adequate strength they necessarily place an enormous weight on the façade. Regarding some [instances] among others, where not only the windows project, but also small rooms supported not with brackets, but directly on the ground, I disapprove of this for two reasons.<sup>30</sup> Firstly, a person cannot look down without pointing his head out. In addition, it blocks the side view of adjacent windows, which should be avoided since people often refuse to tolerate projecting rooms on neighbouring buildings that block the side view from their room, shop or entrance hall, and become involved in disputes and lawsuits. Thus a person who builds projecting rooms onto a façade from the ground up, inflicts an injury on others that they would not wish done to themselves; indeed needlessly so and to no avail, since a side view can be obtained with an iron oriel window which does not obstruct [the view from] the person's own adjacent rooms nor those of the neighbour's house, as described in the following passage.<sup>31</sup>

Concerning wood, this is inappropriate for oriel windows, for the reasons given in the first part of this second chapter.

I therefore prefer iron grids projecting just far enough for a person to be able to look to the side and straight down. I reckon eight or nine inches on the inside, because if they project too far, they place too great a strain on the façade.

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<sup>30</sup> For this passage see Beeckman's commentary in 'Journael', fol. 225r line 29.

<sup>31</sup> For this passage see Beeckman's commentary in 'Journael', fol. 231r lines 8-9.

Dese kijkveinsters in een uytstekende yser tralie dienen soo ghemaect, dat de yzers verstrecken voor windysers, daermen de glasen met haer loot an hecht, sonder ander raem te behouven.

Sulcke yser kijkveinsters sijn stercker en beswaren de gevels min dan als-mense van steen maect, doch staet te ghedencken datter een stene Waterlijst over dient te comen; Ende dat sulcker in elcke camer maer een en comt.

[Glazen vensters]

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 112

Angaende 't cieraet der glase veinsters, angesien die ghemaect worden om windt, regen, sne en coude uyt te sluyten, nochtans de camers licht gevende, soo en soude ick daer in tot cieraet geen schilderie begeren, want die 't licht vermindert : Ten anderen eenige glasen gebroocken wesende, sy en worden gemeenlick niet vermaect, dan met gebroddelt werck, om datmen geen ander sticken en doet schilderen en backen, in plaets der uytgevallen sticken; Maer yet anders in plaets stelt dat met d'ander schilderie niet over een en comt: Daerom soude ick den cost van schilderen (alst immers costelick wesen moest) liever besteden an slypen, daer toe nemende geslepen glasen van platte cristaline spiegels, die soo claer licht geven en daermen alle dingen soo volcommelick deur siet al offer geen glasen en waren.

Isaac Beeckman, 'Journael', fol. 231r lines 12-14

*Glaese veijnsters in cosijnen ende daken in gevels en diergelijcken behooren een duym diep daerin te comen, want dan is het strycken met stryckmortal hebbelycker; t'en sphyt soo niet, is dichter ende valt niet aff.*

III.3 VAN DE WATERLYSTEN

[missing]

These oriel windows in a projecting iron grid should be made so that the iron also serves as a window [frame], since glass and lead can be attached so that no other frame is required.

These iron oriel windows are stronger and less of a burden on the façades than those made of stone, yet it should be remembered that a stone drip course is required above it. And that only one should be built for each room.

[Glass windows]

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 112

Regarding decoration of glass windows, since these are made to keep rain, snow and cold out while providing light for rooms, I prefer no decorative painting on them because this reduces the light.<sup>32</sup> In addition, when panes break, they are normally only restored with substandard work since people do not paint and fire new pieces for those that are missing, replacing them instead with other pieces which do not match the picture. So I would rather spend the cost of the painting (if it was indeed costly) on cutting glass, using cut glass from flat crystal mirrors that give such clear light that everything is as perfectly visible through them as if there were no glass at all.

Isaac Beekman, 'Journael', fol. 231r lines 12-14

*Glass windows in frames and roofs in façades and suchlike should be set to the depth of one inch, since the mortar spreads better then; this way it does not split, it remains watertight and does not break.*

### III.3 ON DRIPSTONES

[missing]

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<sup>32</sup> For this passage see Beekman's commentary in 'Journael', fol. 225r line 29. Because it deals mainly with stained glass, Hendrick Stevin presumably included this passage in his father's statements about ornament that he summarises in a number of discourses in the *Byvough*. From its content, however, the passage does not appear to belong under the heading of the 'Geschild Op beeldich cieraet, op nitsen en op Clocken [Frontipicien], en op Acroteria of Pedestalen'.



Inde 2 form vant 4 Hooftstick deses byvouchs verthoont zijnde de oirdening der gevels, doch onverciert, soo rester nu te seggen van 't cieraet, tusschen 't welck en oirdening, onderscheyt gemaect wort, want met oirdening verstaeten der deelen eens gesticht<sup>46</sup> t'saemschicking, gelijk de voorgaende geweest is; Cieraet is 't gene men op dat t'saemgeschickte tot optoying vervoucht, welke twe met goede redenen onderscheyden worden, want als men al teyckenen de veroirdent en t'samen schickt de gedeelten een huys, alwaermen gemenelick de teyckeningen dickwils verandert, eermen tot een besluyt comt, soo ist niet oirboir daer telkens 't cieraet en verschaeuwing<sup>47</sup> by te stellen, 't welck veel tijts wech neemt, sonder voordering der sake, waer benevens noch gebeurt, dat onervaren eygenaers des gebous, meer siende na 't cieraet door de constige hant gewrocht, dan na de beste oirden het quaetste verkiesen; Indervougen dat slechten gronttreck en stanttreck in sulcken ansien bequamer is.

Dit cieraet heeft twederley vermaerde wysen, diemen nu ter tijdt onduyt-schelic noemt antique en moderne, soo veel beteyckenende als oude en nieuwe wyse, en want de oude haer oirspronck genomen heeft uyt pylaren, diens gebruyck twederley is, 't een tot gerief 't ander tot cieraet, soo sal ick eerst seggen

Vant gebruyckt der pilaren tot gerief

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, p. 104

Dat op twe voornamelicke manieren valt: Ten eersten dienense tot loven, van wiens oirboir en omstandigen geseyt is int 6 Hooftstick der voorgaende Stedenoirdening, en het 3 Hooftstick deses byvougs en breder geseyt sal worden inden Huysbou. Ten anderen tot seer breede percken, diemen sonder 't behulp van pilaren niet bequamelick en soude connen overwelden of besolderen en onder dack brengen; want percken soo smal, datmense lichtelick overwelden can, of datmen balcken vint, lanck genouch om van d'een muer tot d'ander te bereycken, en dich na den eysch om solders te dragen, die en behoortmen met geen pilaren t'onderstellen, gemerckt sy int gebruyck der camers hinderlick zijn, maer seer breede percken, gelijk in kercken en ander groote gestichten, daer moetmense stellen. Om nu te seggen

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<sup>46</sup> 'Gesicht' is printed here, but the context suggests that 'gesticht' must have been intended, a word that Stevin uses for 'gebouw', or building.

<sup>47</sup> In the margin: 'Schenographiam'.

#### III.4 ON THE ORNAMENT OF FAÇADES

H. Stevin, *Materiae Politicae*, *Byvough der Stedenoirdening*, pp. 103-104

The second illustration in the fourth chapter of this appendix<sup>33</sup> depicts the layout of façades, but without ornament. It now remains to discuss ornament, which should be understood as being distinct from the arrangement of the parts of a building as discussed above. Ornament is that which is added to this arrangement for decoration. These are two things that are rightly kept separate since, while the parts of a house are normally ordered and arranged when the drawings are made, during which process changes are usually made in the drawings before a decision is reached, to constantly adjust the ornament and perspective drawings would be unacceptable and a waste of considerable time without achieving any further progress. Indeed, inexperienced owners of buildings may be more interested in artistically-fashioned decoration than in the best layout, making the worst choices.<sup>34</sup> In that sense, simple elevations and ground plans may be regarded as more effective.

There are two well-known styles of ornament, currently known by the un-Dutch terms ‘antique’ and ‘modern’ - by which is meant the old and the new manner. Since the old is based on columns, which have two uses, one for convenience and one for ornament, I shall first address

##### The use of columns for convenience

H. Stevin, *Materiae Politicae*, *Byvough der Stedenoirdening*, p. 104

Columns are mainly used in two ways. Firstly, in galleries, as adequately discussed in detail in the sixth chapter of the aforementioned *Stedenoirdening* as well as the third chapter of this appendix and which will be discussed at greater length in Huysbou.<sup>35</sup> Secondly, in wide spaces that cannot be adequately covered with a vault or ceiling or brought under a roof without the use of columns.<sup>36</sup> Spaces that are so narrow that they can easily be vaulted or for which beams can be found long enough to stretch from one wall to another and broad enough to support ceilings, do not require the support of columns, especially since these impede the use of the room. But in wide spaces, as in churches and other large buildings, they are required. Now to discuss

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<sup>33</sup> The reference is by Hendrick Stevin to his own work; it is not in the original Huysbou text.

<sup>34</sup> For this passage see Beeckman's commentary in 'Journael', fol. 225r lines 1-4.

<sup>35</sup> The reference is by Hendrick Stevin to his own work; it is not in the original Huysbou texts. From this sentence it is also clear that the passages about the 'looven' are not complete. See also Appendix E, Notes on the unfinished Huysbou, p. 496: H. Stevin, *Materiae Politicae*, *Byvough der Stedenoirdening*, '11 Hoofdstick', p. 104.

<sup>36</sup> For this passage see Beeckman's commentary in 'Journael', fol. 225r lines 5-6.

Vant gebruyck der pilaren tot cieraet

H. Stevin, *Materiae Politicae, Byvongh der Stedenoirdening*, p. 104-107

Soo is te weten datse met haer ankleven, als 't gene men onduytshelick noemt pedestael, capiteel, rondbosel, contrabosel,<sup>48</sup> lijste, freyse en veel meer ander (daer int 1 Geschil des volgenden 12 Hooftstix breder afgeseyt sal worden) by de Ouden gemaect wierden van schoone stoffen, constelick gewrocht, en de menschen soo seer behagende, datse daer me de gestichten vercierden, sonder te dienen tot sulck einde van gerief, gelijkboven geseyt is. Sy stelden die voor de gevels, sonder yet nootlicx te dragen, maer alleenlick frisen, frontispisen en diergelijcke, sy deden belet ant sijdeling gesicht uyt de veinsters, maeckten oock dat de veinsters niet heel open en mochten gaen tegen de gevel anslaende, sy strecken dickwils meer tot beswaernis der gevels, dan tot verstyving, sulcx dat eenige Boumeesters regels beschryven, hoemen die daer aen vast sal doen houden: Oock worden poorten en portalen, bebardering<sup>49</sup> der mueren van camers, cassen, buffetten, en ander huysraet daer me doorwrocht, alleenlick tot verciering. Nadien dit pilarich cieraet, datmen nu als geseyt is, antique noemt, seer lange geduert had, Soo begondet over de elf of twaelf hondert jaren op te houden, en quam doen int gebruyck een ander wijze, van moyelicker arbeyt en meerder cost, welcke men tot onderscheyt vande antique nu als voorseyt is, moderne noemt, commende soomen meynt, vande Gotten, die de pilaren alleneck gebruycken tottet boveschreven gerief, maer wat anders om te vercierien, waer af veel voorbeelden zijn, gelijk de groote kercken en seltsamen costelicke torens in haren tijt gemaect, als de vermaerde modernsche torens van Antwerpen, Straesborch en diergelijcke. Dese wijze geduerden tot ontrent negen of thien hondert jaren daer na, sulcx datse over ontrent 150 of 200 jaren begost verlaten te worden, en de antique, dats het out pilarich cieraet, werom in 't gebruyck quam.

Tot hier toe van des cyraets twederley soorte int gemeen geseyt wesende, soo mocht nu de vraech zijn, na de eygentlicke beschryving haerder form, maten en omstandigheden int besonder, om die te vervougen, op de voorgaende platte onvercierde oirdening. Doch want my dunckt datter geen genoechaem seker oirdeel af en is, soo en sal ick my hier daer me niet becommeren, maer den leser senden totte gene die daer af gehandelt hebben, als Vitruvius met syn uytleggers, te weten Daniel Barbarus, en int boven verhaelde 1 Geschil des 12 Hooftstix des Byvongs mijn gevoelen daer van seggen.

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<sup>48</sup> Erroneously: 'cantrabosel'.

<sup>49</sup> In the margin: 'Lambercering'.

## The use of columns for ornament

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, p. 104-107

Thus it is known that the Ancients made these with features, like those known by un-Dutch [terms] as pedestal, capital, fillet, scozia, moulding, frieze and many others (to be discussed at greater length in the first discourse of the twelfth chapter),<sup>37</sup> from beautiful materials, artistically fashioned. And people found these so pleasing that they decorated buildings with them, although no useful purpose was served, as discussed above. They placed them in front of façades, although not supporting anything essential, only friezes, frontons and the like. They obstructed the side view from windows, preventing windows from opening completely, thereby hitting against the façade. Often the columns placed additional strain on the façades rather than strengthening them, so that some architects even wrote rules on how to secure them. Doors and porches, panelling of walls in rooms, cupboards, sideboards and other household goods are also made with them, solely for decoration.<sup>38</sup> This ornamentation with columns, which, as stated, is called antique, having continued for a long time, began after eleven or twelve hundred years to subside and another fashion arose involving more labourious workmanship and greater expense. This is distinguished from the antique by the aforementioned term modern, supposedly originating from the Goths, who used columns only for convenience, as discussed above, and other things for ornament, of which many examples exist, such as the large churches and the unusually costly towers made in their day, such as the famous modern towers of Antwerp, Strasbourg and such places. This style lasted for a further nine or ten hundred years, and only started to be abandoned around 150 or 200 years ago, when the antique style with columns as ornament came into use again.<sup>39</sup>

Having discussed the two sorts of ornament in general terms, the question remains, once their form, proportions and particular situation have been described, how they should be added to the undecorated flat surface of the façade. But since in my view no satisfactory and final opinion has been given on the matter I shall not bother with it here, but refer the reader to those who have discussed it, such as Vitruvius and his commentators, particularly Daniel Barbarus, and will state my own views in the aforementioned first discourse of the twelfth chapter of the appendix.<sup>40</sup>

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<sup>37</sup> The reference is by Hendrick Stevin to his own work; it is not impossible however that in the original Huysbou texts Simon Stevin referred to this discourse with a different numeration.

<sup>38</sup> For this passage see Beeckman's commentary in 'Journael', fol. 225r lines 7-8.

<sup>39</sup> For this passage see Beeckman's commentary in 'Journael', fol. 225r lines 9-14.

<sup>40</sup> The reference is by Hendrick Stevin to his own work; in the original Huysbou, however, Simon Stevin may have referred to this discourse with a different numeration.

Waer benevens ick noch beken, dat gevels, platte evenheyt der stenen, als gehouwen of glat en claerblynckende geslepen, en de stoot<sup>50</sup> vougen suyverlick gewrocht sonder eenich oneven verheven of ingehouwen wercken, (uytgenomen dat om 't gebruycx wille verheven vereyscht te wesen, als van waterlijsten, kijckveinsters en diergelijke) my bequaem cieraet der huysen dunckt om dese redenen.

Ten eersten soo worter inde gestichten, de geduericheyt gesocht, om te weerstaen 't geweld van storm, vorst, regen en Sonneschyn, die metter tijt alle stoffen vernielen, waer tegen een plat even werck langdueriger is dan het gesneen, dat veel dunne teere cantkens en uytsteecksels heeft, die eer deur waten en verteren, of deur ander geweld daer tegen ancommende, eer breken; Oock sittet mos, groente en vuylicheyt, die metter tijt wast, meer inde puttige diepten, dan opt platte der even stenen.

Ten tweden overslach gemaect zijnde van 't gene 't gebou costen sal, soo wil de reden datmen daer me het cierlicke veroirden, datter voor can gemaect worden, maer dat en schynt niet wel nagecommen, als men het buytenste (onderworpen zijnde 't voorschreven geweld van wint, vorst, regen en Sonneschyn) maect van costelick gesneen werck, en 't binnenste, gelijk veel gebeurt, slecht; wanttet soo veel is, al oft ymant sijn leersen gemaect wesende om te dragen in slijck en vuylicheyt, van buyten met costelick bordeursel versierde:

Ten derden soo blijft dickwils een gesticht onvolmaect, om de groote costs wille vant uysterlick gesneen cieraet, 't welck soot plat waer geweest, soude hebben connen voldaeen sijn geweest en oock op corter tijdt, om dattet niet soo lang onder de hant en blijft.

De verciering met antickich pilaerwerck int middel der gevels uytstekende, als portalen gelijk int Stadthuys van Antwerpen, of gevels daer af het middelste deel is ingetrocken als gordinen tusschen twe bolwercken, en bevalt my mede niet, om dat d'uytstekende deelen van d'een en d'ander belet doen ant sijdeling uytzicht vande nevenstaende veinsters.

Soodanich dan vant cieraet myn ghevoelen zijnde, ick zal de voorgaende teyckening des 4 Hoofsticx plat laten, waer op den genen, die dat niet en bevalt, sulcken cieraet van antique, moderne of yet anders brengen mach, als hem best behaecht, tot hulp nemende de costige verschauwingen van dies nu ter tijdt overvloedich in druck uytgaende.

Isaac Beeckman, 'Journael', fol. 231r lines 17-18

*Moluren ende ander cieraet der gevels, daer water in kan blyven leggen, bevallen my niet.*

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<sup>50</sup> In the margin: 'Joinctures'.

In addition, I submit that façades in which the stones are flat and even, whether cut or smooth and polished until they shine, with simple vertical joints and no uneven raised or carved work (except for raised work required for utilitarian purposes, such as drip courses, oriel windows and suchlike) seem to me to provide excellent ornamentation for houses for the following reasons.<sup>41</sup>

Firstly, buildings are required to last, to withstand the force of storms, frost, rain and sunlight which in time destroys all material things, against which flat and smooth workmanship lasts longer than carving, with its many slender fragile edges and protrusions that erode more quickly when exposed to water, or are more likely to break under other violent pressure. Moreover, the moss, vegetation and grime that collects over the years, is more often found in deep indentations than on the flat surfaces of smooth stones.

Secondly, when the cost of the building has been estimated, it is reasonable to want to design it with decorative work that can be made for it, but the result may not be satisfactory if the outside (which is exposed to the wind, frost, rain and sunlight) is made of costly carved work and the inside is inferior, as often happens; like a person who takes a pair of boots designed for walking in mud and grime and decorates them with costly embroidery on the outside.

Thirdly, buildings often remain uncompleted due to the expense of the carved ornament on the outside, which if it were flat might have been finished and in less time since the work is done much faster.

Decoration with antique columns projecting in the centre of a façade, like the central ressalt of the town hall in Antwerp, or façades where the central part is indented like the curtain wall between two bastions, are not to my taste because the projecting parts of the two sides obstruct the side view from the adjacent windows.

These being my views about ornament, I shall leave the previous drawing in the fourth chapter undecorated so that those who do not like it may introduce antique, modern or other decorations as they please, using the artistic perspective drawings that are currently printed in such profuse numbers.

Isaac Beekman, 'Journael', fol. 231r lines 17-18

*I do not like moulding and other façade ornament, because water can collect there.*

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<sup>41</sup> For this passage see Beekman's commentary in 'Journael', fol. 225r lines 15-17.

III.5 VANDE LOOVEN DER GEVELS?

[missing]

III.6 VANDE GEVELS VAN HOUT MET STEEN GEMENGT?

Isaac Beeckman, 'Journael', fol. 225r lines 30-39

*Steen gevels ofte baere freyten moeten door eenen gemeijnen regel onder swaerst sijn; daerom en deugen de uutstekende trigliphi niet, die mettet gewicht daer op kommende, wannichticheyt veroirsaecken. Om in houtwerck ist goet, omdat de ribben achterwaerts in de ribben gewrocht sijn, ende maken door haer uutsteeksels dan de regen sooveel tegen de gevels niet slaen en kan. Maer steene uutstekende kyckenvensters, cantoortjens, &c en deugen niet meer dan uutstekende, uut navolginge des houts.*

III.5 ON GALLERIES IN FAÇADES (?)

[missing]

III.6 ON FAÇADES OF TIMBER COMBINED WITH STONE (?)

Isaac Beekman, 'Journael', fol. 225r lines 30-39

*As a general rule stone façades and piers should be thicker at the base; which is why projecting triglyphs are unacceptable: the weight they bear causes an imbalance. In timber this is fine, since the ends of the joists fit into the [other] joists and the projections prevent the rain from beating hard against the façades. But projecting stone oriel windows, offices etc are not more suitable than those in imitation of wood.*



## IV Van de steygers

IV.1 VAN DE BEQUAMHEDEN ENDE ONBEQUAMHEDEN DIEDER IN STOFF VAN STEYGERS DIENT BEDOCHT TE WORDEN.

[missing]

IV.2 VAN DE BEQUAMHEDEN ENDE ONBEQUAMHEDEN DER WENTELSTEYGERS

[missing]

IV.3 VAN DE STEECKSTEYGERS

[missing]

IV.4 INHOUDENDE VOORBEELDEN VAN GEMEYNGDE STEYGERS NA BEDWONGEN PLAETS.

[missing]

IV.5 VAN EENIGHE TELKONSTIGHE REKENINGEN, DIE IN DE STOF VAN OIRDENING DER STEYGERS KONNEN TE PAS COMEN.

Isaac Beeckman, 'Journael', fol. 225v lines 18-24

lines 18-19

*Gelijck des beelen rechten steijgers booghte tot het aenleggen, soo is yder trapsbooghde tot haer breede.*

lines 20-24

*Wesende in de grondtweyckeninghe eens wentelsteygers opt middelpunt der spille beschreven den boogh eens rondt soo verre de trappen strecken, gelyck des wentelsteygers booghde tot den beelen boogh, alsoo yder traps booghde tot haer booghsken.*

## IV On stairs

### IV.1 ON THE ADVANTAGES AND DISADVANTAGES THAT SHOULD BE TAKEN INTO ACCOUNT REGARDING STAIRS

[missing]

### IV.2 ON THE ADVANTAGES AND DISADVANTAGES OF SPIRAL STAIRCASES

[missing]

### IV.3 ON STRAIGHT FLIGHTS OF STEPS

[missing]

### IV.4 CONTAINING EXAMPLES OF STAIRS THAT ARE MIXED DUE TO LIMITED SPACE

[missing]

### IV.5 ON SOME MATHEMATICAL CALCULATIONS THAT COULD BE USEFUL IN THE MATTER OF DESIGNING STAIRCASES

Isaac Beekman, 'Journael', fol. 225v lines 18-24

lines 18-19

*The ratio of the height of a straight staircase to where it meets the landing is equal to that of the height of each step to its breadth.<sup>42</sup>*

lines 20-24

*When in the floor plan the curve of a spiral staircase is drawn round the central point of the newel post for the full extent of the staircase, the ratio of the height of the spiral staircase to the entire curve is equal that of the height of each step to its particular curve.*

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<sup>42</sup> I.e. depth, rather than width.

Isaac Beeckman, 'Journael', fol. 232v lines 4-6  
lines 4-6

*Een steyger in een camer, lanck 24 voet, sal afdakinge hebben van 18 voet. De hooghde sij  
12 voet. Dats een trap hoogh 6 duym, breet 9 duym.*

Isaac Beeckman, 'Journael', fol. 232v lines 4-6  
lines 4-6

*A staircase in a room, 24 feet long, requires a cap 18 feet long. The height is twelve feet. That is six inches high, nine inches deep for each step.*

# v Van de solders en overwelfsels

## V.1 VAN HOUTE SOLDERS

Isaac Beeckman, 'Journael', fol. 232r lines 1-9

*Houdt aeneen is stercker dan gescheyden* [in the margin]

*Men sal eenen solder maken stercker met balcken dan met plancken alleen. Dan al heeft d'een sooveel hout als d'ander als te sien is in twee camers, elk van 24 voet lanck en breed, d'eene hebbende 5 balcken elk een voet dick ende de plancken een duym dick: op d'ander camer een solder overal 3 duym dick. langse te vooren<sup>51</sup> Houdt aeneen can meer dragen als gescheyden, als blijktt doen ick aen twee stocken gewicht binck totdat se braken. Daer sagh ick hoeveel meer als dobbel gewicht datter hangen konde aent heel houdt dan aent geclooven. Alsoo ist oock best in de overwelfselen sommige stercke bogen te maken.*

## V.2 VAN GEPLYSTERDE SOLDERS

Isaac Beeckman, 'Journael', fol. 228r lines 1-10

*Pleysteringh of leemplacken* [in the margin]

*Pleysteringh (seggt de pleysteraer) wordt gemaectt van cleij met calverbaer ende geraept hooij, lanck 5,6,7, of 8 duym, gemenght. Dat strijckt men tegen de solder; daerop nagelt men wilge latkens, daerop strijckt men dan witte Doornixen calck gemenght met wit calverbayr ende noch wat anders (dat de pleysteraer niet noemen en wilde). Daerna boetseert men daerop alst wat drooge is, doch soo dat men de calckxgroeven tot in de kley douwen can. Alles hout aeneen door her hayr, maer men moet het kalck hier ende daer douwen in de kley.*

Vande manier des gebous om versekert te syn tegen brant

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 118-119

Angesien 't peryckel van brant soo groot is, dat menigen daerom laten costelicke huysen te bouwen, of te coopen en liever hun gelt an ander goet besteden, ja datter somwylen an hanckt het leven der gener die by nacht daer af overval-

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<sup>51</sup> The words 'langse te vooren' are written as a separate sentence.

# v On ceilings and vaults

## V.1 ON WOODEN CEILINGS

Isaac Beekman, 'Journael', fol. 232r lines 1-9

*When joined, wood is stronger than when separate.* [in the margin]

*A ceiling made with beams is stronger than with planks alone. Even if one ceiling employs the same amount of wood as the other, as can be seen in two rooms, each 24 feet in length and width, one employing five beams of a foot thick and planks of one inch thick, while the other room has a ceiling that is consistently three inches thick. Lengthways. When joined, wood is stronger than when separate, as was shown when I hung weights on two sticks until they broke. I saw that much more than twice the weight could be hung from the whole timber than from the cut [timber]. So it is also better to build strong arches in vaults.*

## V.2 ON PLASTERED CEILINGS

Isaac Beekman, 'Journael', fol. 228r lines 1-10

*Applying plaster or lime* [in the margin]

*Plastering (says the plasterer) is made of a mixture of clay with calf hair and gathered hay, 5, 6, 7 or 8 inches long. This is spread over the ceiling; willow wood slats are nailed over this, over which white Tournai lime is spread mixed with calf hair and something else (that the plasterer refused to divulge). It is moulded when fairly dry, when lime grooves can be pressed into the clay. It is held together with the hair, but chalk has to be pressed into the clay here and there.*

On how to protect buildings against fire

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 118-119

Since the danger of fire is so great that many give up the idea of building or buying expensive houses and prefer to spend their money on other things, so that people's lives are at risk if suddenly overcome [by fire] at night, it is not

len worden, soo en ist niet buyten reden, datmen in ettelicke Steden verbiet, daken met stro of riet te decken, en beveelt hart dack te leggen; Noch oock dat wy letten op de manier des gebous, daer mede men tegen brant best mach versekert wesen: 't Welck angemerckt ick sal daer af mijn gevoelen schryven als volght: Alle gevels en sijdmueren met haer veinster cassynen, sgelijcx oock alle deur cassynen, sullen van steen zijn, sonder eenich hout daer ingewrocht.

De solders salmen, van onder dick bepleysteren, na de manier inden huysbou beschreven, of noch beter in die plaets steene overwelfsels maken, van welke mede inden huysbou eygentlick gehandelt sal worden: De spannage of cap van gesaecht hout wesende, salmen oock dick bepleysteren, en decken met tegelen, daer int 10 Hooftstick deses byvougs af geseyt is, welke int vier gebacken zijnde, den brant connen verdragen beter dan leyen, loot, of coper: Alle binnen gedeelte vant huys, als steygers, portalen, schrijfpercken, heymelicken, cassen, turfbacken en diergelijcke sullen al overwelf syn van steen, 't welck geschien mach na de lijksydige oirdening die ick daer af inden huysbou beschryven sal: Ande schoorsteen en sullen noch houte mantels, noch ander houtwerck commen, maer oock alles van steen. De mueren der camers en salmen niet bebarderen (daer gemeenlick muysen, rotten en ander vuyl gedierte achter nestelen, en dickwils van groote cost zijn) maer die liever met tapyten behangen: De fonteynen veroirdent in alle camers of percken, na de manier die int 4 Hooftstick deses byvougs beschreven is syn benevens ander gerief, oock vorderlick om tegen brant over al water byder handt te hebben. Huysen alsoo gebout, worden daer me tegen brant seer versekert, want gelijk stenen schauwen daermen geduerlick vier in stoockt, niet en verbranden, alsoo alle ander stucken van steen gemaect: En hoewel houten stoelen, bancken, tafels met diergelijcken brandelicken huysraet, pereyckel mochte onderworpen zijn, dat en can niet verre strecken; soo lange de stof en form vant huys in wesen blijft, en dat de selve, onbrandelick zijnde, geen oirsaeck noch onderhout des brants van huysraet wesen can: Hier beneven hebben sulcke huysen met gepleysterde solders en daken ten grooten deele, alle de voordelen en bequaemheden der stene overwelfsels daer inden huysbou breder verclaring af geschien sal.

### V.3 VAN DE STEENE OVERWELFSELS

- 1 Lidt van de eygenscapen en voordeelen der steene overwelfsels en de beschrijving van haar vervouging tot decksels der camers
- 2 Lidt van vier gemeene regels op bogen en overwelfsels
- 3 Lidt van eenige aenteyckeningen op bogen en overwelfsels

unreasonable that many towns forbid roofs to be covered with straw or thatch and require hard roofs to be built. We shall therefore also focus on ways of building that ensure the best protection against fire. Having examined this I shall state my views on the subject as follows: all façades and side-walls with window frames and all door frames should be made of brick or stone, without incorporating any timber.

Ceilings should be thickly plastered underneath, as described in *Huysbou*, or preferably brick vaults should be built, as will be discussed in *Huysbou*. A span or roof construction of sawn timber should be covered with a thick coat of plaster and with tiles (as stated in the tenth chapter of this appendix) which, being fired, resists flames more effectively than slate, lead or copper. All the interiors of a house, such as staircases, porches, studies, privies, cupboards, peat boxes and the like, should also be built with brick vaults, which should be constructed according to the like-sided system that I shall describe in *Huysbou*. No timber mantelpieces or other woodwork should be built round the chimneys; here everything should be made of brick. The walls of the rooms should not be panelled with wood (since mice, rats and other pests may build nests behind them and they are often expensive) but rather hung with carpets. In addition to their other uses, washbasins in all the rooms or compartments, described in the fourth chapter of this appendix, are also useful in providing water in case of fire. Houses built like this are well protected against fire. Just as the brick hearths in which fires are lit do not themselves burn, neither do all the other objects made of brick. And while wooden chairs, seats, tables and similar inflammable household objects may be in danger [in a fire], it cannot spread far as long as the materials and the structure of the house remain intact, and since these themselves do not burn, they cannot cause or fuel the burning of furnishings. Houses with plastered ceilings and roofs generally have all the advantages and qualities of brick vaults, a more detailed account of which will be given in *Huysbou*.<sup>43</sup>

### V.3 ON STONE VAULTS

1. Section on the properties and advantages of stone vaults and a description of their application as a covering for rooms
2. Section on four general rules for arches and vaults
3. Section containing notes on arches and vaults

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<sup>43</sup> Hendrick Stevin is alluding to his own work; this account is not found among the original *Huysbou* texts. The features and advantages of stone vaults that he refers to as being described elsewhere, come immediately after this text in Stevin's *Huysbou*. Cf. also appendix E, Notes on the unfinished *Huysbou*, p. 498: H. Stevin, *Materiae Politicae, Bywough der Stedenoidening*, 14 Hoofstick, p. 119.



Isaac Beeckman  
folio 231 verso lines 17-18

*A is crancker B want e/f/g uitgebouwen synde, is B gelyck A*  
[ill. 30]

Isaac Beeckman, 'Journael', fol. 232r. lines 10-32  
lines 10-13

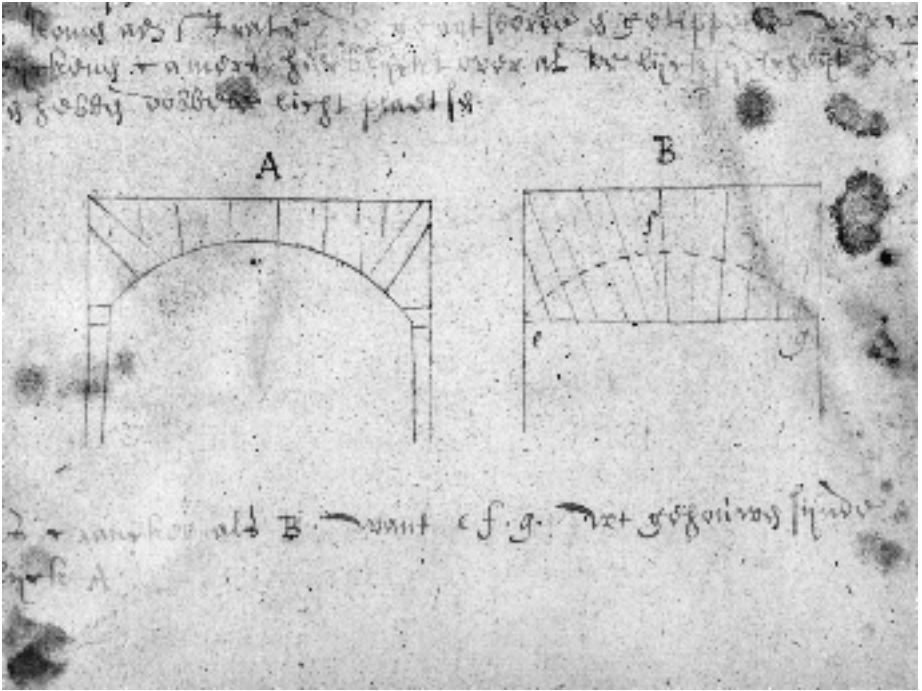
*Om overwelfselen te maken is eens booghs kleynder deel stercker dan syn grooter deel, de freyten sterck genoech sijnde ende buyten twyffel, want de freyten stutten ende ondersteunen de nederste eynden des booghs, die andersints van binnen bloot ende dunder staende souden oock syn.*

lines 14-19

*Die met de kortste pesen sijn de sterckste, wel verstaende als dichte en hooghde des muers van d'een en d'ander boogh even. groot is. Oock sijn de boghen eens overwelfsels, de rechte linie naest wesende, de cranckste, alsoo dat rechte linien, streckende lancx de cruijn des overwelfsels, dit geen sterckte, maer beswaringhe geeft, gelijk men in veel kercken<sup>52</sup> siet.*

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<sup>52</sup> De Waard transcribes it as 'keucken', with vaults I would be more inclined to read 'kercken'.



ill. 30

Isaac Beekman, 'Journal', folio 23<sup>v</sup> lines 17-18

[ill. 30]

*A is weaker than B because if e / f / g is cut away, B is equal to A*

Isaac Beekman, 'Journal', fol. 23<sup>r</sup>. lines 10-32  
lines 10-13

*When making vaults the smaller part of the arch should be stronger than the larger part, the buttresses should be strong enough and beyond doubt, since these bear and support the lower ends of the arches that would otherwise be insecure and thinner on the inside.*

lines 14-19

*Those with the shortest spans are the strongest, assuming that the thickness and height of the walls of all the arches is the same everywhere. Vaulted arches almost forming a straight line are the weakest, since straight lines extending along the crest of a vault impose extra weight without providing extra strength, as can be seen in many churches.*

lines 20-21

*Ick moet ondersoecken, waerom ronde overwelfsels, als brootovens, soo sterck syn, nochtans sooseer pladt wesende.*

lines 22-26

*balcken verrotten aen de eynden inde muer [in the margin]*

*De eynden der balcken, soo verre sij in de muyl steken verrotten wel tot de gront toe in 60 jaeren van wegen de scherpe bytende intrekkende vochticheydt des nieuwen moorters. Misschien is dit te helpen, soomen die eynde bestreke met spiegelberst, gelyck men sommige bierkisten doet.*

lines 27-29

*De huysen ontsetten haer dickwils ende men en weet niet vanwaer het comt. Doch can gebeuren dat het stryckhout, heel in de muyl leggende verrot is of crimpt, ende alsoo de reste moet sacken.*

lines 30-32

*De wyste kelders, die hier te landen vallen, meugen van 26 of 26 voeten syn. Worden overwelft met een boogh van een backsteen dick.*

lines 20-21

*I must investigate why round vaulted ceilings, as in baker's ovens, are so strong despite being so flat.*

lines 22-26

*The ends of beams inserted into a wall tend to decay [in the margin]  
The ends of the beams inserted into a wall decay so much that they collapse onto the ground within sixty years due to the sharp, biting moisture of fresh mortar. It may help to smear the ends with rosin, as with beer barrels.*

lines 27-29

*Houses sometimes subside and it is not known why. Occasionally the border trusses set into the wall may decay or shrink and so cause the rest to subside too.*

lines 30-32

*In this country cellars should be 26 or 26 feet at the widest, vaulted with an arch one brick thick.*

## VI Vande daken

### VI.1 STOF DER DAKEN

From H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 98-102

Het dack is soo voornamelicken deel des geheels, dat gelijk een lichaem sonder hooft, geen mensch en can wesen, alsoo vergaring van stoffen sonder dack geen huys. Ende gelijkmen gemeenlick segt, alst hooft sweert soo sweeren al de leden, alsoo oock wanneer het dack ondicht is, de rest verderft: Want balcken, solderingen, houtwerck, ja somwijlen boecken, en papieren van groot belanck, lywaet, cleeren, bedden en ander huysraet, verrotten en bederven: Oock ist verdrietich by duyster nachten, vanden regen binnenshuys overvallen te worden, en 't bedde te moeten ruymen, gelijk het menigen gebeurt: Wyders men siet in vervallen Steden, dat veel huysen ledich staen en niet en connen verhuert worden, ja dat niemant daer in woonen wil, sonder huer te betalen, maer alleenlick het onderhout besorgen: Sulcx dat de eygenaers geraetsamer vinden, de huysen af te breecken en de stof te vercoopen, dan het onderhout te becostigen: Dese verderving comt gemeenelick deurt inwateren; want het binnenste houtwerck dat drooch blijft, can duysent jaren deuren: Inder vougen dat daken en afwateringen soo veroirdent wesende, datse altijd van selfs loopen, sonder geduerige opsicht en hulpe te behouven, sulcke ongevallen niet onderworpen en zijn, maer meugen sonder oncost van onderhout, een beter tijt verwachten. Vyt welcke dingen te verstaen is, de saeck der daken van geen cleen belanck te wesen en groot opsicht te vereysschen; Te meer dat die goet te maken soo groote swaricheyt in heeft, dat de menschen niet tegenstaende alle haer neersticheyt daer toe niet bestandichs hebben connen vinden, gelijk sy wel doen int bouwen van gevels en sijdmueren, welke men veel vint die over de duysent jaren gestaen hebben, maer niet hun daken die daerentusschen benevens geduerige lapping en onderhout, dickwils vernieut zijn geweest, of t'eenmael vervallen.

Daerom dat de vermaerde Boumeesters, soo veel van daken seggen, en wy hemlien volgende, oock dit vermaen daer af doen, 't en schynt niet buyten wegen.

## VI On roofs

### VI.1 ROOFING MATERIALS<sup>44</sup>

From H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 98-102

Roofs are such an important part of the whole that, just as a body without a head cannot be a human being, materials assembled without a roof do not make a house. And, as the saying goes, if the head is infected so are the limbs; similarly, if the roof is not weatherproofed, the rest deteriorates. Beams, ceilings, woodwork, indeed even books and important papers, linen, clothes, beds and other household goods, moulder and spoil. It is annoying to be surprised by rain inside the house in the dark night and to have to move the bed, as happens to many people. In declining towns, furthermore, many houses are left empty and cannot be let. People are not even willing to live in them without rent, just ensuring their maintenance. In fact the owners prefer to demolish the houses and sell the materials rather than pay for their upkeep. Deterioration generally starts with leaks. If left dry, the interior woodwork can last for a thousand years. Inasmuch as roofs and drains that are designed to work automatically without requiring continual care and upkeep are not affected by these problems, they can last longer and without the cost of maintenance. From which it is clear that the question of roofs is of no small importance and requires detailed consideration. Especially since making them well is so difficult that despite all their efforts people have been unable to develop solutions the way they have for building façades and side-walls, many of which have stood over a thousand years. Not so their roofs which, in addition to constant restoration and maintenance, are often rebuilt or fall into total disrepair.

That is why famous architects focus so much on roofs and why, in emulation of them, we warn about this as well, and apparently not without reason.

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<sup>44</sup> This title is not found in the table of contents, but derives from the passage in which Stevin announces the new subject of the 'shape of roofs'. Cf. also appendix E, Notes on the unfinished *Huysbou*, p. 496: H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, 10 Hoofstick, p. 102.

De stoffen die de menschen daer gemeenlick toegebruycken, elck na 't gene t'sijnder plaets best te becommen is, sijn stroo, riet, barders, tegelen, pannen, leyen, loot, cooper, steene overwelsels: Maer elck heeft sijn ongeval, want stroo en riet maken wel dicht dack, inden winter warm, en schuttende inden somer de brandende hitten, maer 't verrot haest, 't is sorgelick voor brandt, 't is inwendich vuyl van spinnewebben en stof, muysen en ratten nestelen daer in, 't is van buyten lelick int gesicht, het regenwater datter afvalt, is onsuiver en onbequaem om in regenbacken te vergaren: Barders sijn het rotten onderworpen, en deur hete sonneschyn het splyten, oock den brandt en van geen langduerichey: Tegelen en pannen splyten vanden vorst, met geweldige stormen sietmense met groote menichte afwaeyen, niet sonder perijckel der gener dieder onder gaen: Leyen vereyschen geduerige cleustering, sulcx datmen tot veel plaetsen den Leydecker het onderhout by den jaer besteet: Het loot wort door heet sonneschyn soo gewellich opgetrocken, dattet spletten crijcht, en de saudure ontgaet, den brandt in huys gerakende het smelt en druypt af, sorgelick voor de gene die den brandt willen lesschen, het staet in pereyckel, meer als d'ander verschreven stoffen, van genomen te worden, deur diemender over al greeet gelt voor crijcht, en is sulcken ongeval seer gemeen daer 't crijchsvolck veel verkeert, waer tegen geen landen lange versekert en sijn: Het cooper noch costelicker wesende, is oock dergelijcke ongevallen onderworpen: Angaende steene overwelsels, die en sijn niet dicht, maer moet daer over een dack commen met sijn houten spannage, soomen deur ervaring siet in overwelfde kercken en ander gestichten. Binnen Middelburch in Zeelant is over de Abdie kercke een overwelsel geleyt in plaets van dack, 't welck een Abt Intaer met groote voorsichticheyt t'sijnen costen dede maken, maer het is ondicht, en wiert onlanx gesproocken van een spannage daer over te doen leggen: Ick hebbe gageslagen verscheyden platte formen van hartsteen met ciment en loot seer sorchvuldelick gewrocht, maer sy waren altemael de ondichticheyt onderworpen, en moesten een geduerige toesicht en onderhout hebben; Bovendien sijn sulcke overwelsels noch van groote cost, om haer dicke sijdmueren, verstijft met steunstylen, t'samen gehouden met ysere anckergarden.

Maer om nu te seggen welcke wyse van alle dese ick voor de beste houde, soo is voor eerst te weten dat als de gene die in Hollandt huysen willen bouwen, van daken raet vragen aen Timmerlien, Pandeckers en Panbackers, sy sullen gemeenlick al tot pannen raden, daer sy angewent sijn: In Vlaender al tot tegelen: Dat nu elck bouwer soude besluyten (gelijckt gemeenlick gebeurt) te willen doen na 't lants wijse; Ick seg daer op sulcx een Ingebooren wel te vougen in cleeren en meer ander: Als in Hollandt te gaen met een Turcksche hoet of ruban, 't waer onburgelick gedaen: Maer in daken en hout die regel geen plaets: Want wijslicker is te woonen onder een goet dack op de Grieksche wyse, dan onder een quaet na 's landts gebruyck.

The materials that people generally use, according to what is easiest to acquire locally, are straw, thatch, shingles, flat tiles, clay tiles, slate, lead, copper, brick vaulting. Yet all these have disadvantages. Straw and thatch, while providing a weatherproof roof, warm in the winter and sheltering against the burning heat in the summer, decays quickly, forms a fire hazard and becomes filthy inside, with spiders' webs and dust, nests of mice and rats, while outside they look ugly and the rainwater that drips from them is dirty and unsuitable for collecting in rain tanks. Shingles also tend to decay and split in the heat of the sun. They too are a fire hazard and do not last long. Flat tiles and clay tiles split in frost. In strong winds they get blown away in large numbers, not without danger to people walking underneath. Slates need constant fixing, so that in many places a slater is hired every year for maintenance. Lead expands so much in the hot sunshine that it cracks and the solder is lost. When a house catches fire the lead melts and drips, endangering those trying to extinguish the fire. It is more liable to be stolen than the other materials mentioned since money can easily be obtained for it anywhere, a problem which is common whenever soldiers arrive, from which no country is safe for long. Copper, being even more expensive, is subject to similar dangers. Brick vaults are not weatherproof, so a roof has to be built over them with a truss construction, as experience shows in vaulted churches and other buildings. In Middelburg in Zeeland a vault has been placed over the abbey church instead of a roof, which Abbot Intaer had built with great care at his own expense. Yet it is not weatherproof and recently there was talk of building a roof construction over it. I have seen several stone ceilings carefully made with cement and lead, but these all suffered from porosity and required constant attention and maintenance. Moreover these vaults are expensive, since they need thick side-walls, reinforced with buttresses and tied with iron wall-cramps.

But to state which of these methods I consider best, it should first be remembered that anyone intending to build a house in Holland who asks advice about roofs from carpenters, tilers and tile-makers, will generally be advised to use clay tiles, since that is what they are used to. In Flanders [they recommend] flat tiles, since all builders decide (as often happens) according to the custom of their country. I say adapt to the locals in clothing and suchlike; to walk around in Holland with a Turkish hat or turban would be improper. But do not apply the rule to roofs. It is better to live under a good roof built in the Greek style, than under a bad one built in the country's own style.



Angaende pannen die en bevallen my niet, nochtans nadiense in Hollandt, daermen nu seer bout, deurgaens gebruyckt worden, en an daken soo veel gelegen zijnde als vooren verhaelt is, soo sal ick van haer eygenschap en verlijcking met tegelen meer seggen, dan ick anders doen soude. Voor al sijn de Hollantsche pannedaken seer leck om dese redenen: Genomen datter sy een pannedack waer af elcke panne lanck wesende 12 duym, en op de eynden malcander bedeckende 1 duym, soo blijfter tusschen beyde 10 duym, wesende ynckel panne, waer deur als sy sponsjachtich of spletich zijn, het water sypende langs de panne, en can niet weder buytenshuys geraken, om dattet an 't eynde met mortel gestopt en bestreken is, sulcx dattet daer, of leger, moet afdruppen op de solder: En dit aldus met groote menichte van pannen toegaende, soo gebeuret als verhaelt is, benevens ander der voorschreven ongefallen, dat de lieden daer onder inder nacht het bedde moeten ruymen: Hierom wort metter daet bevonden, dat daken daer de pannen los op liggen, onbestreken, min deur wateren, dan de bestreken, want het geene lanck een panne van binnen afsypt, geraeckt weerom daer buyten, op de panne dieder onderlicht; Maer sulck daken sijn weerom quaet, om datter de dryfsne overvloedelick deur waeyt, en dat sulcke solders seer cout zijn: De reden waerom sulcx met tegeldaken niet en gebeurt, is dusdanich : Later een tegeldack zijn, daer af elcken tegel de twe derdendeelen bedeckt is, en een derdendeel bloot, 't welck leck zijnde, soo can het water daer deur sypende, binnens huys op de solder niet druypen, maer valt op de tegel daer onder liggende, en soot van de selve niet altemael buyten waert en liepe, maer dat die tegel leck zijnde, het water daer oock deur sepe, soo ontmoetet noch een derde tegel, en want over al tusschen twe tegels mortel licht, en datment bovendien van binnen beplaesteren mach, so en soude het regenwater niet alleen deur drie tegels moeten sypen, maer bovendien noch twemaal deur soodanige mortel, en eyntlick deur die plaestering, welcke al goet zijnde en wel versteent qualick meugelick schijnt.

Sulcx dat mijn gevoelen vant beste dack overeencomt met dat van Albertus Leo; An welcken tegeldaken best bevallen; Te weten platte vierhoeckige tegelen van goede cley soo hart gebacken, dattet regenwater, die niet en deur weyckt noch alsoo vervriesende, en daer na doeyende die niet en bederft; Voort datse liggen op een stercke spannage, en malcander als boven de  $\frac{2}{3}$  bedecken, hebbende goede neusen daerse ande latten me hangen, en suyverlick gewrocht, datmen van buyten geen mortel en siet, 't welck ick houde voor het dichste dack; Want boven de voorschreven voordeelen, de leckheyt die gemeenelick is inde keelen der cruysdaken gedeckt met pannen of leyen, en heeft met tegelen geen noot, om dat alles op verbant comt met keeltégels daer toe crom gebacken:

Tegeldack is oock gedueriger en dat minste onderhouding behouft: Ick heb int Iaer 1604, tegeldaken gesien tot Sluys in Vlaender, noch dicht, recht en

Regarding clay tiles, I do not consider them satisfactory, not even the way they are used in Holland, where they are widely made and laid on roofs as described above. I shall therefore address their properties and how they compare with flat tiles more [closely] than I would otherwise. Firstly, Dutch tiles are extremely leaky, for the following reasons. Take a tiled roof where every tile is 12 inches long, with each one covering the other at the end by one inch, so that there are 10 inches between them which is only single tile. If they become spongy or crack, then water seeping along the tile is not lead out of the house, because at the end it is plugged and smeared with mortar, so that either there, or lower down, it is bound to drip through onto the ceiling. And when this happens with a large number of tiles, the situation described above occurs, in addition to other aforementioned misfortunes, and the people below have to move their beds at night. Therefore it has been discovered in practice that roofs on which tiles are laid loosely, without being smeared with mortar, leak less than those that are smeared, since the water that seeps inside along a tile, comes out again on the tile below it. But roofs like this are also defective since lots of snow blows through and because lofts like this are extremely cold. The reason why this does not occur with flat-tiled roofs is as follows.<sup>45</sup> On a leaky flat-tiled roof, with two-thirds of each tile covered, and one-third exposed, when water seeps through into the house it does not drip into the loft but falls onto the tile below, and even though it does not all flow out if that tile is also leaky, it seeps through that one too and encounters a third tile, and since mortar is laid everywhere between two tiles, and since the ceiling can be plastered on the inside, for rain to drip not only through three tiles, but twice through mortar, and in the end through good, solid plaster, hardly seems possible.

Thus my own views regarding the best roof are the same as those of Leone Battista Alberti. He prefers flat-tiled roofs. Namely flat square tiles of good clay baked so hard that the rain cannot leak through, nor are they spoiled if it freezes and thaws afterwards. Furthermore they should be placed on a strong timber structure and, as stated above, two-thirds of each [tile] be covered, with good noses to attach them to the laths, and finely wrought, so that from the outside no mortar is seen. This is what I consider the most weatherproof roof. Besides the above advantages, the leaks that are common in the groins of cross-roofs covered with pantiles or slates, are not a problem when flat-tiles [are used], since they is bonded with groin tiles that are especially fired in a curved shape for this purpose.

A flat-tiled roof also lasts longer and requires less maintenance. In the year 1604, in Sluys in Flanders I saw flat-tiled roofs that were neither weatherproof,

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<sup>45</sup> Cf. for this passage Isaac Beeckman's commentary, 'Journael', fol. 232r. lines 33-39

vast liggende; waer af d'Inwoonders aldaer getuychden, datter vanden tijt af doense eerst gemaect waren, geleden zijnde over de 50 jaren, noyt verbetering an en hadde gedaen geweest.

Angaende men hier in Hollandt, daermen int gemeen pannen gebruyckt, segt de tegelen te swaren spannage te vereysschen, die reden en bevalt my niet, gemerckt daer me voorcommen wort 't voorschreven gemeen ongeval der ongeduericheyt; Ia houdet daer voor, datmense noch swaerder behoort te maken, om noch meerder geduericheyt uyt te verwachten. Doch alles ingesien na behooren, pannedacken en sijn niet soo veel lichter dan tegeldacken als men wel meent; Want pannen commen boven en terzijde op malcander, tegels niet dan boven; cromte der pannen brengt swaerte me, meerder dan recht uyt der tegels; Pannedaken en mogen so vlack niet liggen als tegeldaken, maer moeten om haer groote deursyning, meerder steyltte hebben, 't welck swaerder en hooger dack maeckt, daer de stormen grooter geweld op doen dan op vlacker en leeger tegeldacken.

A passage is missing here about roofs made of mortar and wood which are plastered with trass both inside and out.

Isaac Beekman, 'Journael', fol. 227v lines 1-2

*Beste daken loof met potaerde ende tras, en steen daerop. Elck bysonder en is niet goet.*

#### VI.2 FORM VAN DAKEN

H. Stevin, *Materiae Politicae, Byvough der Stedenoordening*, pp. 102-103

Tot hier toe is vande stof der daken geseyt, belangende de form, die is van vierderley voornamelicke verscheydenheden, als Sijdgotichdack, Voorenachtergotichdack, Cruysdack, en Trechterdack. Sijdgotichdack is, diens regenwater vant huys valt in goten op de sijdmueren liggende, streckende gemenelick vande straet achterwaerts. Voorenachtergotichdack is, diens regenwater op de voorsijde en achtersijde vant huys afvalt, in goten streckende gemeenelick ewydich vande straet. Cruysdack is int welcke twe rechte necken recht cruysseling op malcander commen. Trechterdack is, dat niet gespannen wordt vande muerplaten opwaerts, gelijk de drie voorgaende, maer vande muerplaten

straight nor firmly fixed, where the occupants testified that since the time they were first made, more than fifty years before, it had never been necessary to make improvements.

Regarding the opinion here in Holland, where pantiles are usually used, that flat-tiles require too massive a roof construction, I do not agree with this argument, since they answer the aforementioned disadvantage of lack of durability. Indeed, I believe that they should be made even heavier, to get even longer life out of them. But when built properly, pantiled roofs are not much lighter than flat-tiled roofs are thought to be, since pantiles are laid over each other both above and on the sides, while flat-tiles are only laid over each other from above. Moreover, pantiles are bent, which means that they weigh more than flat-tiles, which are straight. And pantiled roofs cannot lie as flat as those made with flat-tiles, but need to be steeper, because of the ease with which water seeps through, which makes for heavier and higher-pitched roofs, so that storms strike with greater force than they do on more level, lower flat-tiled roofs.

A passage is missing here about roofs made of mortar and wood which are plastered with trass both inside and out.<sup>46</sup>

Isaac Beecman, 'Journal', fol. 227v lines 1-2

*The best roofs foliage with compost and trass, and stone on top. Each of these separately is not good.*

#### VI.2 THE SHAPE OF ROOFS

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 102-103

So far I have addressed the materials used for roofs. As for their shape, there are of four main varieties, namely side-gutter roofs, front and rear-gutter roofs, cross roofs, and funnel-shaped roofs. A side-gutter roof is one from which the rainwater falls into gutters along the side walls, usually extending from the street to the rear. Front and rear-gutter roofs are those from which the rain falls on the front and rear of the house into gutters that normally run parallel to the street. A cross roof is one on which two straight ridges cross each other at right angles. A funnel-shaped roof is one that is not stretched upwards from the wall-plates, as with the three preceding roofs but downwards from

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<sup>46</sup> Cf. also appendix E, Notes on the unfinished *Huysbou*, p. 496: H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, 10 Hoofstick, p. 102.

neerwaerts na het middelste vant huys, om het water aldaer te vangen in regenbacken gemaect na de manier beschreven int 9 Hooftstick deses byvouchs, en ter plaetsen daer toe veroirdent inde twede form des 4 Hooftsticx.

Stevin's son Hendrick abbreviated the above passage. A discussion is missing of the advantages and disadvantages of the different types of roof with various illustrations. Stevin himself preferred funnel-shaped roofs. His son transferred part of the description of funnel-shaped roofs to the passage he wrote about the model house.

Isaac Beeckman, 'Journael', fol. 232v lines 1-3

*De cruysdaken en syn t' verstoppen des snees niet onderworpen ende deselve valt al op de eijgenaers grondt, De solders krijghen daer door gevellicht ende worden veel ruymmer.*

lines 7-9

*Cruysdaken en lijden soo grooten gewelt niet van stormen, omdat se van alle sijden met muijren besedt syn. vallen schoonder in d'ooghe, syn versekert tegen buyrdackdieven.*

lines 14-18

*De rechte daken bevallen mij noch beter dan cruysdaken, omdat se steylder vallen; de gevels hooger comen tot beter bewaringe der daken ende schoonder in de ooghen. de gaten en verstoppen niet. Maer alst water in den regenback vervriest ende dan snee valt, ende daerop grooten regen, soo cruypt het water in huijs door de tegels.*

lines 19-20

*De roolejdack kost 20 gld., pannen 8 guld., 100 verglaesde pannen 5 gulden, ander 36 st*

the wall-plates towards the middle of the house, catching the water there in cisterns built in the way described in the ninth chapter of this appendix, and in the places allotted for it in the second illustration of the fourth chapter.<sup>47</sup>

Hendrick Stevin abbreviated the above passage. A discussion is missing of the advantages and disadvantages of the different types of roof with various illustrations. Stevin himself preferred funnel-shaped roofs. His son transferred part of the description of funnel-shaped roofs to the passage he wrote about the model house.<sup>48</sup>

Isaac Beekman, 'Journael', fol. 232v lines 1-3

*Cross roofs do not tend to be blocked by snow, which falls on the owner's ground instead. Lofts get light through the façades and are much more spacious.*

lines 7-9

*Cross roofs do not suffer so much from storms, since they are protected by walls on all sides. They look more beautiful, and are protected against thieves climbing in from the neighbour's roofs.*

lines 14-18

*I prefer straight roofs to cross roofs, because they have a steeper pitch; the gables are higher, offering better protection of the roofs and are more beautiful to look at. The gutters do not get blocked. But if water freezes in the cistern and snow falls, followed by heavy rain, water can seep into the house through the tiles.*

lines 19-20

*A red slate roof costs 20 guilders, tiles are 8 guilders, 100 glazed tiles 5 guilders, others 36 stuyvers*

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<sup>47</sup> The reference is by Hendrick Stevin to his own work; it is not impossible however that in the original *Huysbou* texts Simon Steven referred to this description and illustration with another chapter numbering.

<sup>48</sup> Cf. also appendix E, Notes on the unfinished *Huysbou*, p. 496: H. Stevin, *Materiae Politicae, Byvough der Siedenoirdening*, 10 Hoofstick, p. 103.

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 116-117

Het trechterdack heeft de bequaemheyt dattet al thuyt deur fonteinkens geeft, sonder water te moeten putten of pompen. Ten heeft geen goten noch de swaricheden die van goten commen, maer water en snee valt daer vrylick af, sonder de Naburens huysen te verhinderen, oock sonder de snee te moeten uytchuppen. Dese daken en lyden soo groot geweld der stormen niet, om datse an allen sijden met muren en gevels beschermt zijn. De Daken (die gemeenlick onbehaegelicker int gesicht syn dan gevels) en worden hier niet gesien, maer commen de schone gevels alleen int gesicht.

VI.3 HET GESCHIL VAN BORSTWEEREN DAER DAKEN OP RUSTEN.

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 115-116

Daken op borstweeren te doen rusten, en schynt geen goe regel, want het uytwaert drucken der daken, daer tegen ancommende, doet de sijdmueren wijcken, de spannage ontsetten en de geweld op de houten pennen ancommen, 't welck in groote stormen de meeste swaricheyt heeft, en de huysen seer vercrenckt, daerom bevallen my beter dacksolders sonder borstweeren, op wiens muerplaten ande solder vast gewrocht zijnde, de daken commen te rusten want alsdan en can de swaerte des dackx de muer niet uytwaert drucken, maer perst daer op recht neerwaert, met der sijdmueren meerder vasticheyt, uyt oirsaeck dat dan den solder, wesende als gront eens driehoecx, soo en connen de uysterste, van dien niet wijcken, of de deelen des solders als balcken, ribben en plancken souden eerst moeten van malcander scheyden.

Angaende geseyt wort datmen met een borstweer meer ruymte onder het dack cryckt, men antwoort daer op, dat alst daerom te doen waer, soo mochtmen het borstweer twe of drie voeten hooger trecken, totte vliering solder toe, en daer boven een dack op de solder rustende. Want alsoo crychtmen met weynich cost een verdieping meer, wesende vaster werck met meerde ruymte en hupscher form van camers.

Angaende ymant seggen mocht, dat men Bouwer dickwils syn huysing veroident na 't vermogen van syn gelt, en dat soo veel meerder cost hem ongelegen soude vallen, of dat hy soo veel meer ruymte niet van doen en heeft; Men antwoort daer op, dat een die besluyt altijt met een halve verdieping te willen eynden, en dattet om de voorschreve reden, sonder halve verdieping t'onpas soude commen, ten schynt in geen genoechsamen reden gegront. Of soomen

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 116-117<sup>49</sup>

The advantage of a funnel-shaped roof is that it provides a water source for the whole house without having to pump or go to the well. It has no gutters or the disadvantages of gutters, but water and snow fall off unimpeded, without this being a nuisance for neighbouring houses and also without having to dig away the snow. These roofs do not suffer any great violence from storms, because they are protected on all sides by walls and gables. These roofs (that generally do not appear as pleasing as gables) are not seen, and all that can be seen are the beautiful gables.

### VI.3 DISCOURSE ON PARAPETS THAT SUPPORT ROOFS

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 115-116

Placing roofs on parapets is clearly not a good rule, since the outward pressure of the roofs weighs down on them, causing the side walls to give way, the roof construction to become displaced and the pressure to bear down on the timber posts that absorb the brunt of major storms which cause a great deal of damage to houses. This is why I prefer lofts without parapets, with wall-plates tied firmly to the ceiling, on which the roof rests. Then the weight of the roofs cannot force the wall outward, but presses straight down on it, with the side walls also being more secure, because, since its foundation is in the form of a triangle, the outside sections cannot give way unless the parts of the loft, such as beams, joists and planks are dislocated.<sup>50</sup>

Concerning the opinion that a parapet provides more space under the roof. To achieve this, the parapet could be built two or three feet higher, up to the garret, with a roof resting above it on the loft. In this way it is possible to obtain an extra storey at little cost, this being a more solid construction with more space and rooms of a more elegant shape.

Given that people often commission an architect to build a house according to the amount of money at their disposal and say that the extra expense would be inconvenient, or that the space was not available, one might answer that a person who decides to finish with half a storey, and thinks that for the above reason it would be incomplete without that half storey, clearly does

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<sup>49</sup> The following passage comes from Hendrick Stevin's description of the model house. It does not belong to *Huysbou*, but he probably based this passage on a text that was intended for inclusion in the work.

<sup>50</sup> Cf. for this passage Isaac Beeckman's commentary, 'Journael', fol. 232v. lines 10-13.



wil nemen dat des Bouwers gelt, 't welck hy geschickt heeft te verbouwen, vorder streckt, dan om te maken een verdieping, maer niet soo verre om te maken twe verdiepingen, hoewel sulcx meer eygensinnelickheyt schynt dan in reden gegront, soo antwoortmen daer op, dat hy die eene verdieping int geheel, soo veel grooter mach maken, dat hy met syn gelt can toecommen, blyvende alsoo voor beslyt, om de beste oirdening te volgen, by daken op solders rustende sonder borstweeren te maken.

not have sufficient grounds for this choice. Or if the money available for the construction can be stretched further than just one storey but not so far as to make two storeys, while this would seem to be more a case of obstinacy than reason, the answer is that this one entire storey can be made as large as the funds allow, while remaining true to the best design with a roof that rests on the loft, and without building parapets.

# VII Van de oirdeningh der deelen eens huys als der camers lichplaetsen, gaelderyen, hoven blocken ende ten laesten der deelen welcke een camer heeft

## VII.1 VAN DE VERVOEGINGE DER LICHTPLAETSEN EENS HUYS

Vande vervouging der lichtplaetsen.

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 50-57

Het licht valt in tweederley ansien, het een van ghedeelten der camers, als van steyghers, ganghen, contoiren, heymelicken en dierghelijcke, daer af gheseydt sal worden int 3 Lit desen Hooftsticx : Het ander van hele camers, 't welc sy crijghen deur lichtplaetsen daer af mijn voornemen is hier te handelen. Tot dien eynde segh ick, dat anghemerckt sulck licht inden huysbou van groot belanck is en dat deur ghebreck van ghemeene reghel op de saeck der lichtplaetsen, dickwils veel onbequamelick veroirdent wordt, soo wel in cleene burgherlicke en groote Vorstelicke, als middelbaer huysen, soo sal ick mijn ghevoelen van sulcke ghemeene regel hier verclaren; want hoewel die yghelick niet bevallen en sal, noch my selver niet langher, dan tot dat ick een beter sie soo acht ick nochtans dit vermaen oirboir, om dattet oirsaeck van sulcke verbetering soude connen wesen.

Ick sal om de vervouging deser lichtplaetsen te verclaren, eerst voorbeelt stellen metten gront van een groot huys, daer na van cleene.

Laet tot dien eynde dese 1 form grontteyckening sijn van een huys met dobbel rijen van camers rugheling tegen malcander, die beteyckent worden mette verbruynde vierhoecken; De onverbruynde witte percken beeden lichtplaetsen, welcke hier tweederley vallen, als groot die ghemeen sijn, en cleene dienende tot besonder gherief der huysinghen, of camers daer se ancommen: Welcke cleene lichtplaetsen (commende inde doorsnijdinghen of doorcruysinghen van twee rijen der huysen) daer oock oirboir verstaen worden, om dat by aldiense niet en waren, tot 16 verscheyden plaetsen, 4 camers sonder licht

## VII On the layout of the parts of a house, such as rooms, courtyards, galleries, gardens, blocks and finally of the parts of a room

### VII.1 ON THE DISPOSITION OF COURTYARDS IN A HOUSE

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 50-57

Light falls in two ways. Firstly, in parts of rooms, such as in staircases, corridors, offices and privies and suchlike, which is discussed in the third part of this chapter.<sup>51</sup> Secondly, in entire rooms, where it enters from courtyards and which I intend to discuss here. I mention this in order to show that this kind of light is tremendously important in architecture<sup>52</sup> and since the absence of a general rule regarding courtyards often results in the layout being improperly executed, both in small private houses and in large palaces, as well as in medium-sized ones, I shall explain my opinion regarding the general rule here, because while it may not please everyone, and even myself only as long as I do not find one better, nonetheless I consider it worth recommending since it may represent a source of much improvement.

To explain the disposition of these courtyards, I shall first provide an example of a floor plan of a large house, and then of a small one.

To this end this first illustration shows a floor plan of a house with double rows of rooms back to back represented by shaded squares. The white non-shaded compartments are courtyards, of which there are two sorts here, namely large ones which are common areas and small ones for the particular convenience of the various houses, or adjacent rooms. These small courtyards (either in intersections or crossings between two rows of houses) are clearly necessary, since if they were not there, in sixteen separate instances there would be four rooms without light, and in twenty instances two rooms

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<sup>51</sup> The reference is by Hendrick Stevin to his own work; it is not impossible however that in the original *Huysbou* texts Simon Steven referred to this part of the chapter with a different system of numbers.

<sup>52</sup> The Dutch expression here 'inden huysbou' is clearly referring to the art of building houses or architecture in general and not to Stevin's treatise on architecture, *Huysbou*.

soude sijn, en tot 20 verscheyden plaetsen 2 camers sonder licht. De reden waerom de boveschreven dobbel rijen van camers my beter bevallen dan ijnc-[ill. 31] kel, sal t'sijnder plaets inden huysbou verclaert worden.

Deur dese form hebbende 25 lichtplaetsen, die lijksijdelick veroirdent sijn, is genoegh te verstaen de gemeene reghel hoemen tot alle huysen, hoe groot die wesen mochten, de lichtplaetsen soo can veroirdenen, dat elcke camer haer vrylicht heeft, en int geheel met lijksijdige gestalt: Oock sietmen de gemeene regel over minder huysen dan dit, want gelijk hier elcke sijde van 5 lichtplaetsen in alles geeft 25 lichtplaetsen, alsoo d'een sijde van 6 d'ander van 4, geeft 24 lichtplaetsen, van 5 en 4 commender 20, en soo voort met minder.

Noch staet hier te gedencken, dat hoewel dese 25 gemeene lichtplaetsen al even groot geteyckent sijn, nochtans eenighe meerder of minder te moghen veroirdent worden, blijvende [ill. 32] even welgaghelagen de gemeene regel van vry licht en ghelijksijdicheydt, als by voorbeelt, het groot huys des Conincx van Spaignen te Escoriael, daer af hier in dese 2 form een grontteyckening ghestelt is (doch sonder seker maet, alsoo ick die ghetrocken heb uyt de verschaude teyckening daer af in coper druck uytgaende) hebbende 11 lichtplaetsen daer af de drie A, B, C, veel grooter sijn als d'ander acht, en dat om op de drie sijden vry licht te gheven ande kerck, die beteyckent wordt mette groote verbreynde plaets D. Angaende de vierde sijde by E, daer canse haer vry licht vant hof hebben, al welcke lichtplaetsen met bequame lijksijdicheydt, soomen siet veroirdent sijn.

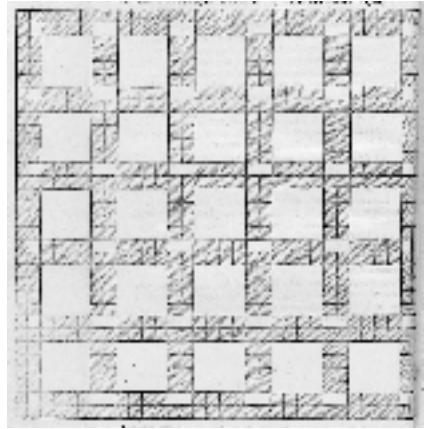
Tot hier toe is geseyt vande lichtplaetsen der groote huysen, ick sal nu totte cleene commen, al waer te anmercken staet, dat de gemeene burgers erven lanck en smal sijn, want totte breedte van 20 of 30 voeten isser somwijlen wel 200 langde of meer, uyt oirsaeck dat de twee straten daerse tusschen ligghen, dickwils 300 voeten of meer van malcander sijn.

without light. The reason why I find the aforementioned double row of rooms more pleasing than a single [ill. 31] one will be explained in due course in *Huysbou*.<sup>53</sup>

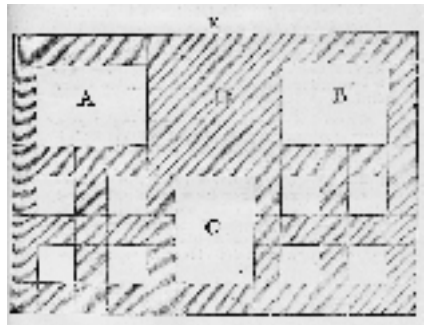
This illustration, with 25 courtyards laid out in like-sided fashion, illustrates the general rule by which courtyards can be built in all houses, no matter how large, so that every room receives unimpeded light and the whole has a like-sided form. Here, a general rule can be seen that also applies to smaller houses. Just as here, each side having five courtyards produces 25<sup>54</sup> courtyards in all, one side having six and the other four produces 24 courtyards, while five and four produces twenty, and so on.

Note also that although these 25 common courtyards are drawn in equal size, some may be larger or smaller, [ill. 32] as long as the general rule of unimpeded light and like-sidedness is observed, as for instance in the palace of the kings of Spain at the Escorial, of which this second illustration provides a ground plan (although not in exact proportion, since I took it from a perspective drawing based on a copper print). Of its eleven courtyards, three, A, B, C, are much larger than the other eight, in order to shed light freely on three sides of the chapel, drawn here as the large shaded area D. From the fourth side, E, it receives light from the garden, all the courtyards being laid out, as can be seen, with pleasing like-sidedness.

Until now the discussion has been about courtyards of palaces. I shall now turn to small houses, regarding which it should be noted that the plots of ground of ordinary citizens are long and narrow: they may be twenty or thirty feet wide, but they are sometimes 200 or more feet in length, since the two streets between which they lie are often 300 feet or more apart.



ill. 31



ill. 32

<sup>53</sup> The reference is by Hendrick Stevin to his own work; it is not impossible however that in the original *Huysbou* texts Simon Steven referred to another part of the chapter in this place. See appendix E, Notes on the unfinished *Huysbou*, p. 493; H. Stevin, *Materiae Politicae, Byvough der Steden-oirdening*, 2 Hooftstick, pp 51-52.

<sup>54</sup> The number given is 23, but the figure shows 25 courtyards.

Om van sulcke lichtplaetsen de ghemeene reghel te verclaren, soo laet in dese 3 form A B C D E F G H soodanighe langhe smalle erve beteyckenen, welke alleenlick wesende van een camers breedte, soo en connender gheen lichtplaetsen vallen op de sijde met camers beset, als inde twee voorgaende formen, daerom salmen ande straetsijde twee camers ruggeling teghen malcander veroirdenen, als A, B, volghende daer na de lichtplaets C, achter de selve weerom twee camers als D, E, na dese de lichtplaets F, hier achter weerom twee camers als G, H, en soo voort tot datmen soo veel huysing heeft alsmen begeert, of de plaets toelaet, waer me openbaerlick elcke camer haer vry licht heeft.

[Ill. 33 – in margin]

Deur gebreck van te volgen sulcken regel of noch een beter, isser tot veel plaetsen en voornamelick in Hollandt, ongeschicktelick ghebout, alwaermen menichte van huysen vint met drie camers an malcander, en een open plaets daerachter, even als of A, B, C deser 3 Form drie camers waren, en D een lichtplaets, waer mee B soo duyster is, datmender in ettelicke plaetsen s' middachs met brandende keersen in eet, maer alles onnoodich alsmen dese reghel volcht: Waer me men noch aldus van achter bevrijt is met huysing als D, commende ruggeling teghen des achterbuers huysing of erve, daer anders de bevrijding op een muerken of houten heyningh ancomt.

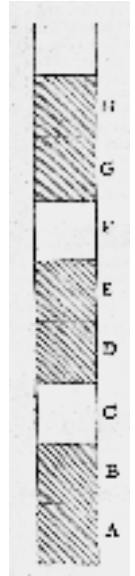
Noch staet te anmercken, dat na dese manier van lichtplaetsen, elck eyghenaer sijn licht op sijn erve schiept, sonder dat de nabueren sijn veinsters connen verduyteren,elijckt dickwils gheschiet, wanneer men het licht sijdeling haelt door dackveinsters of dieghelijcke: waer mee oock gheschuwet can worden veel Geding<sup>53</sup> en onrust, die uyt sulcke oirsaeck tusschen nabueren valt: Noch sijnder veel huysbouwers, die achter de camer B, veroirdenen somerkeuckens, turfschueren, heymelicken, washuyskens en dieghelijcke, die 't licht des camers B, seer benemen, den ganck in C, daer doormen na die achterhuysen gaet verduyteren, en de openplaets daer achter nauwer maken en van ongeschickter form: Maer beter bevalt my in ste van die, te maken een vierhoeckigh stick, als D over de heele breedte der plaets, daer al die stucxkens t'samen incommen, latende tusschen beyden de gheschickte vierhoeckighe ruyme licht plaets C, schoonder int ghesicht, bequamer int gebruyck en sonder daerom meer erve te moeten verliesen, of meerder cost te doen: Doch wordt verstaen datmen van B in D comt, door een beslooten loofken 3 of vier voeten breed, met sijn glase veinsters, even al oft altermael een huys waer, oock sonder dattet selve loofken

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<sup>53</sup> In the margin: 'Pleydoyen'.

To explain the general rule of these courtyards, let A, B, C, D, E, F, G, H in this third illustration represent a long narrow plot in which, being only one room wide, no courtyards can be built at the side where the rooms are, as in the two previous examples. Two rooms are therefore arranged at the street end back to back, namely A, B, followed by a courtyard, C, behind which another two rooms, D, E, after these a courtyard, F, behind which two rooms, G, H, and so on until the required amount of accommodation is achieved, or as much as the site allows, with each room receiving unimpeded light. [ill. 33] Failing to follow this rule, or indeed a better one, [results in] inferior building in many places, especially in Holland where one finds a great many houses with three rooms one after another and an open area behind, as though A, B, C in this third illustration were three rooms, and D a courtyard, with B being so dark that often the midday meal is eaten by the light of a candle. Which would be unnecessary if the rules were followed, so that the rear would not be obstructed by the building, D, standing back to back with the neighbour's house or plot, or separated by a small wall or wooden fence.

Note, moreover, that this sort of courtyard allows each householder to receive light on their own plot without neighbours obscuring the windows, as often happens when light is received at an angle through dormer windows or suchlike, thereby also preventing many disputes and unrest between neighbours. There are, however, many architects who design summer kitchens, peat sheds, privies, wash houses and suchlike behind room B and in the passage in C, depriving room B of much light, obscuring the rear of the house and making the open area behind narrower and less convenient in shape. By contrast, I prefer a square plot covering the whole width of the court, like D, where all these places are brought together, leaving in between a decent spacious square courtyard, C, which is more pleasant to the eye and more convenient, without losing more of the ground or incurring any extra expense. Clearly, however, D is reached from B through a covered gallery three or four feet wide with its own glass windows, as if it were all one house, but without



ill. 33



het licht der camers van B en D verhindert, daer af int 3 Hoofdstick eyghentlick sal gheseyt worden. Dese manier van beter oirden meyn ick t' Antwerpen meer ghebruyckt te worden dan in Hollandt.

Daer worden oock lichtplaetsen ghemaect voor de huysen na de straet toe: De selve hebben haer bequaemheden en onbequaemheden. De bequaemheden sijn dusdanich:

Ten eersten datse goet sijn voor dieven die deur d'eerste muer, of deur moeten breken of gheraken eerse an 't huys commen.

Ten 2 soo ist een vrye bequame plaets (voornamelick alsse haer looven heeft) om in te wandelen en ander oeffeninghen in te nemen buytens huys en nochtans niet op straet.

Ten 3 sijn die plaetsen goet voor mans die niet en begeeren dat hun Vrouwe, of Dochters voor den veinsters ten thoon sitten, en besocht worden vande ghene die langhs de strate voorbygaen. Oock me so en connen de Vreyers haer lieden s'nachts deur de veinsters niet commen besoecken, ghelijckse wel doen deur veinsters die ande straet staen.

De onbequaemheden sijn als volght.

Ten eersten als men 't hooft uyt de veinsters steeckt, men siet niet watter op straet ommeget: Ten anderen en connen sulcke huysen van Ambachtslien of Cooplien die open wijnckels moeten hebben ande straet uytcommende, niet gebruyckt worden, streckende somwijlen tot achterdeel der eyghenaers diese daer na willen verheuren of vercoopen.

Ick heb inde cluppen van Noorweghen huysen gesien na de manier der Romeynsche Atria, te weten crijghende haer licht int middel, doch bedeckt met varckens blasen.

Vande Looven der Lichtplaetsen.

H. Stevin, *Materiae Politicae, Byvough der Stedenoordening*, pp. 57-59

Die vallen op tweederley wijsen d'een langhs de huysing, d'ander door 't middel der lichtplaets malcander cruysenden. Angaende d'eerste soorte, ick soude daer oock liever hebben buytelooven van ghedaente als de looven voor de huysen op beyde sijden der straten, daer int 6 Hoofdstick der voorgaende Stedenoordening af gheseydt is dan binnelooven die de ghevels draghen, welcker beyder ghedaenten en ander omstandigen inden huysbou 't haerder plaetse eyghentlick sal verclaert worden, en dat om de redenen aldaer beschreven, namelick dat de camers, daer achter vryer lichter crijgen, en dattet vaster ghebou maect: Noch valt hier te segghen int ghebruyck te sijn van inde lichtplaetsen twee of drie looven d'een boven d'ander te veroirdenen, mede inden voorseyden huysbou beschreven dienende voor gemeene gangen tot al de camers daer op uyt commende: Maer het ongherief der selve is, dat den Vorst, Vorstinne,

this gallery obstructing the light from the rooms in B and D, as will be discussed specifically in the third chapter. This superior layout is, in my opinion, used more in Antwerp than in Holland.

There forecourts are also built in front of the house, leading to the street. These have advantages and disadvantages. The advantages are as follows.

Firstly, that they are effective against thieves who have to pass or break through the first wall before they can get into the house.

Secondly, it is a fairly pleasing place (especially if it has galleries) to walk in and exercise outdoors and yet not be on the street.

Thirdly, forecourts are ideal for men who do not want their wife or daughters to sit in the windows to be seen and called at by people passing in the street. Neither can lovers visit their sweethearts at night through the window, as they certainly can through windows [that open onto] the street.

The disadvantages are as follows.

Firstly, when one leans out of the window, it is impossible to see what is happening on the street. Moreover, these houses are unpractical for craftsmen or traders who require publicly accessible shops that open onto the street, which may sometimes be to the disadvantage of owners who wish later to rent or sell.

On the cliffs of Norway I have seen houses built in the manner of Roman atria, namely obtaining light from the centre, but covered with pig's bladders.

On galleries in courtyards

H. Stevin, *Materiae Politicae, Byvough der Stedenoidening*, pp. 57-59

These are positioned in two ways, either the side of the house, or intersecting in the centre of the courtyard. As stated in the sixth chapter of the preceding *Stedenoidening*, regarding the first, I prefer external galleries shaped like those on the fronts of the houses on either side of the street to internal galleries supporting the façade (both forms of which and other details will be explained in due course in *Huysbou*) for the reasons described [in *Huysbou*], namely that the rooms behind them receive more unobstructed light and that it makes for a more solid structure. However, here I shall discuss the use of two or three galleries, one above the other, in courtyards, as described in part in the aforementioned *Huysbou*, which serve as general passages to the adjoining rooms.<sup>55</sup> The disadvantage of this, however, is that the prince or princess, officials and

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<sup>55</sup> Allusions by Hendrick Stevin to his own work and his intended *Huysbou*. Further it is clear from this that he was also to have been a discussion about 'inner galleries' and galleries on top of each other.

groote Amptlien en ander, niet bequamelick en connen ghebruycken de camers, die boven hemlien camers sijn, uyt oirsaeck datse om daer te commen, uyt hemlien camers moeten gaen, deur een gemeene open loove de steyghers op na de hoogher loove, en van daer inde camer boven de hare: 't Welck ongherievich is, voornamelick alst regent, hagelt en sneeut, waeyt en stormt, en dattet by nacht wel noodich is lanteernen te gebruycken. Ja men bevint in veel Vorstelicke huysen (voornamelick in coude landen) dat om dese oirsaeck de bovelooven ghestopt worden met houtwerck of ander slecht gebou, lelick int ansien:

Ten anderen ist verdrietich boven sijn hoeft gherucht te hebben van loopen, danssen, springen, waterstorten en dierghelijcke, en dat somwijlen by lieden daermen geen bevel over en heeft, of daermen niet gheeren over en beveelt.

Ten derden camers die hun licht teenemael deur sulcke looven moeten krijghen, vallen duyster om dat de veynsters, boven de cruycen geen vry licht en connen gheven, gelijkse inde beneenste dacklooven wel doen.

Ten vierden camers diens veinsters commen in looven, boven de onderste loove, sijn onvry, om dat de gheene die langs de loove daer voorbygaen, deur de veinsters inde camers connen sien, gelijkmen van binnen daer uyt siet, 't welc inde beneenste dackloove, soo niet en ghebeurt, om dat den vloer der camers op kelders ghebout wesende, ontrent de 3 voeten hooger is dan den vloer der loove: Sulcx dat om de voorgaende redenen, 't gebou met looven d'een boven d'ander, my niet en bevalt.

Om nu te segghen vande cruyslooven, soo is te weten datter in sommighen lichtplaetsen wel dacklooven gemaect worden, niet langs de huysinghen als de voorgaende, maer cruysseling over 't middel des plaets, mits dat de inganghen [ill. 34] der camers daer na veroirdent sijn: Maer om dat by voorbeelt te verclaren, soo laet dese form een huysinghe<sup>54</sup> sijn met een rechthoekighe lichtplaets ABCD, waer in A beteyckent de groote voersael. B, C, D, sijn drie ganghen, daermen in elck deur een poorte inkomt, te weten C een ganck daermen deurgaet achter na den Hof, B en D twee ganghen op de sijden, doch niet heel deur gaende ghelijck de ganck C maer ten eynde veinsters hebbende, die ande ganck licht geven: In elck deser ganghen sijn vier deuren der camers daer an kommende: Vande deur of poorte der voersael A totte poorte an C, is de dackloove AC, en van de poort B totte poort D, is de dackloove BD malcander cruysende in E, ghelijck anwijzen de tippelinghen, bediende pilaren op beyde sijden der looven; ende want hier gheen ander deuren op de lichtplaets uyt en commen dan teghen de vier einde der looven, soo canmen deur dese looven

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<sup>54</sup> Erroneously: 'hnysinghe'.

others do not have convenient access to the rooms above, since to get there they have to go from their room through an open gallery, climb the stairs to the upper gallery, and from there to the room above. This is most inconvenient, especially if there is rain, hail or snow, if it is windy or if there is a storm, and at night it is certainly necessary to use lanterns. Yes, for this reason in many palaces (especially in cold countries) the upper galleries are enclosed with wood or some other shoddy structure of unsightly appearance.

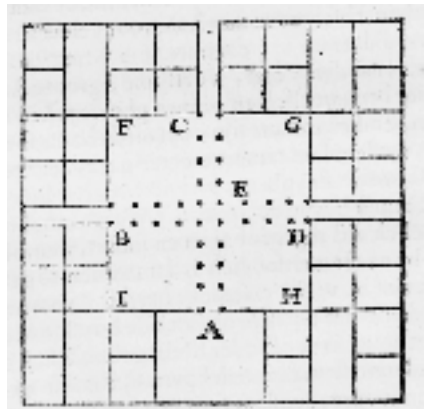
Secondly, it is irritating to hear walking, dancing, jumping, pouring water and suchlike above one's head, especially by people over whom one has no control or would not wish to control.

Thirdly, rooms that receive light through such galleries are dark since the windows above the crossbars do not provide unimpeded light, as the lowest roofed galleries do.

Fourthly, rooms in which windows look out on galleries above the lowest gallery, lack privacy, since people on the gallery can see through the window into the room, just as from the inside one can see out. This is not the case with the lowest roofed-over gallery, since the floors of these rooms are built on cellars [and] are around three feet higher than the floor of the gallery. So for these reasons I do not approve of buildings with galleries on top of one another.

Turning now to discuss cross-galleries, in some courtyards roofed galleries are built not against the houses as in the preceding description, but cross-wise through the centre of the courtyard,

and the entrances [ill. 34] to the rooms are laid out accordingly. To explain this with an example, this illustration represents a house with a rectangular courtyard A, B, C, D, in which A represents the hall. B, C, D are three passages, with a door at each entrance, that is C is a passage which leads to the back of the garden, B and D are two passages at the sides, not open all the way like passage C, but with windows at the end to provide light in the passage. Each of these passages



ill. 34

has four doors providing access to the rooms. Extending from the door or entrance of the hall, A, to the entrance C is the roofed gallery A C, and from entrance B to entrance D, is the roofed gallery B D, crossing at E, as shown by the dots representing columns on either side of the galleries. Because there are no other doors here leading into the courtyard apart from those at the four ends of the galleries, these galleries provide access to every part of

commen tot al de percken vant huys, bevryt voor regen sonneschijn, of anders geseyt sonder te moeten gaen onder de bloten Hemel.

Angaende ymandt segghen mocht, dat elcke twee camers commende an de vierhoecken F, G, H, I, gheen uytcomst op de lichtplaets en hebben, daer wort op gheantwoordt: Dat Amptlien die daer ghelogeert worden, ghemeenlick meer dan een camer behouven; In welcken ghevalle men bequamelicker comt van de eerste totte tweede door deuren binnens huys, dan van buyten, 't welck na d'ander wijse vallen moet.

De bequaemheden deser cruyslooven, boven de gheene diemen langhs de huysen bout sijn desen: Ten eersten dat den rechten wech van A tot C en van B tot D corter vallen: Ten anderen soo benemen dese min licht der camers als d'ander: Bovendien soo schijnt de form van sulcke cruyslooven behaghelicker int ghesicht.

## VII.2 VAN DE VERVOEGINGE DER LICHTPLAETSEN EENS BLOCKS BURGERLICHE HUYSEN

Vande oirdening der Burgerlicke huysen eens Blocx.

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening, 1 Onderscheyt Vande Oirdening der Steden*, pp. 24-30

Soo ymant een heel block Burgerlicke huysen mocht bouwen na sijn wille, 't soude mogelick syn die soo te veroirdenen, datse daer in hadden dusdanige voordeelen:

Ten eersten dat den hoff of lichtplaets van elck huys so bevrijt souden wesen, datmen vande hooghste veinsters vant een huys, niet en soude connen sien inde veinsters vant ander huys.

Ten tweden dat by nacht geen dieven in eenigen hof soude conne gheraken, of sy moesten over de huysen climmen, sulcx dat lijnwaet op den bleyck en ander goet daer in so versekert soude sijn, als oft in huys besloten waer.

Ten derden dat elcke der vier sijden des blocx an de straten heel met huysen soude beset sijn, sonder eenighe mueren van hooven daer an te commen, daer des nachts de dieven souden connen overclimmen, en hebbende nochtans alle camers overal vry bequaem licht.

Ten vierden datmen in sulcke oirdening de Lijcksijdicheyt can gaslaen, sulcx dat soodanich block mette selve cost beter een Vorstelick gesticht soude gelijcken dan versamelingh van gemeene burgerlicke huysen.

Laet tot dien eynde dese eerste form grontteyckening van een block bedien, lanck by voorbeelt 240 voeten, breed 180 voeten; waer in veroirdent sijn acht huysen, hebbende elck ses viercante percken, yders sijde van 30 voeten, waer in de gheartseerde en ghetippelde viercanten, camers beteyckenen, de ong-

the house, sheltered from rain and sunshine, in other words without having to walk under the open sky.

Regarding the suggestion that neither of the two rooms looking out on the corners F, G, H, I, have doors onto the courtyard, it may be answered that the officials who lodge there generally need more than one room. In this case it is more convenient to pass from the first room to the second through doors inside the house than outside, which would otherwise be necessary.

The advantages of cross-galleries compared to those built alongside the house are these. Firstly, the straight path from A to C and from B to D is shorter. Secondly they take less light from the rooms than other [types of galleries]. Moreover, the form of these cross-galleries is more pleasing to the eye.

## VII.2 ON THE DISPOSITION OF COURTYARDS IN A BLOCK OF PRIVATE HOUSES

On the layout of a block of private houses

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening, 1 Onderscheyt Vande Oirdening der Steden*, pp. 24-30

If it were possible for a person to build a whole block of private houses according to his own wishes, it should be feasible to order it in such a way that it would have the following advantages:

Firstly, that the courtyard or garden of each house be so secure that one would not be able to see into the windows of a house even from the highest windows of another.

Secondly, that at night no thieves would be able to enter the garden, unless they climbed over the houses, so that linen put out to bleach and other goods would be as safe as if locked up indoors.

Thirdly, that each of the four sides of the blocks on the street would be entirely filled with houses without any walls of courtyards leading to them that thieves could climb over at night, and with all the rooms everywhere having pleasant and unimpeded light.

Fourthly that in such a layout like-sidedness can be observed, so that a block like this would, without adding to the cost, look more like a princely palace than a collection of common private houses.

To this end let this first illustration serve as a ground plan<sup>56</sup> for a block, 240 feet long for instance, and 180 feet wide; in which eight houses are planned, each with six square compartments, with 30 feet for each side, with the shaded and dotted squares standing for rooms, and the ones that are not shaded or

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<sup>56</sup> Compare the drawing and the summary of the following passage in Isaac Beekman's commentary, 'Journael', folio 232 v. lines 13-16.

heartseerde en onghetippelde zijn lichtplaetsen; te weten op elcken houck een Huys als A B C D E F, hebbende vyf camers A, B, C, D, F, mette lichtplaets E: En opt middel der voorsyde en achtersyde een huys als G H I K L, hebbende vier camers G, H, K, L, [ill. 35] mette lichtplaets I, inhoudende twee viercanten: Maer opt middel der slinckerseyde en rechterseyde een huys als M N O P Q, hebbende vier camers als M, N, P, Q, mette lichtplaets O inhoudende twe viercanten.

Dit soo veroirdent wesende, soo sullen daer uyt volgen de dingen die vooren gesejdt sijn. Om van 't welck verclaring te doen en eerst vant vrylicht te segghen, soo blijkt dat int houckhuys A B C D E F de camer A vry licht can hebben op twee sijden beyde na de straet; B en F connen vry licht hebben vooren na de straet, en van achter op de licht plaets E; Voort C na de straet; D na de licht plaets E; En alsoo mette drie huysen op d'ander drie houcken staende. Van het huys int middel der voorsz. syde, geteyckent G H I K L, connen de twee camers G en H licht hebben van vooren op straet en van achter op de licht plaets I; De twee camers K, L, connen licht hebben op de lichtplaets I; en alsoo mettet huys int middel der achterste sijde. Van het huys int middel der slinckerzijde geteyckent M N O P Q, connen de twee camers M, Q, licht hebben van vooren op de straet; En de twe camers N, P, van achter op de lichtplaets O; En alsoo mettet huys in 't middel der rechtersyde. Angaende het tweede punt, namelick elcken hof aldus soo vry te wesen, dat niemant vande nabueren door sijn vensters daer in sien en can, wordt aldus verclaert: De lichtplaets E vant houckhuys A B C D E F heeft op de drie zijden haer eygen gevels mette veinsters die daer in noodich zyn; Maer de vierde sijde is gevel van des nabuers huysing P, sonder eenighe veinsters daer in te commen, als daer oock niet noodich zynde, alsoo de camer P, haer licht schept op de lichtplaets O, sulcx dat gheen der nabueren sien en connen in dien hof of lichtplaets, noch oock in eenige veinsters vant huys, ghelijckmen oock van daer in gheen ander hooven of veinsters sien en can. 't Is oock kennelick dat by nacht gheen dieven daer in en connen geraken, of sy en souden moeten over de huysen climmen. Oock is kennelick dat de Lijcksijdeheydt hier in soude connen gagheslagen worden, sulcx dattet met cleene cost een Vorstelick gesticht (gelijck vooren gesejt is) soude mogen gelijcken.

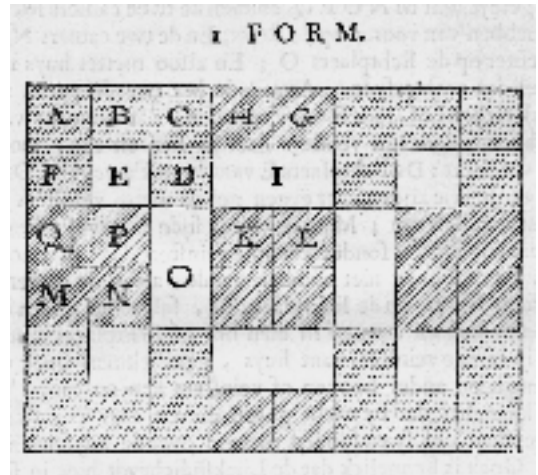
Alsmen de twee middelste huysen der voorsyde en achtersyden van een viercant breeder wilde veroirdenen, de teyckening soude dan vallen als in dese 2 form.

dotted being courtyards; that is to say at each corner a house such as A, B, C, D, E, F, having five rooms A, B, C, D, F, with E as the courtyard: and in the middle of the front side and the rear side a house such as G, H, I, K, L, having four rooms G, H, K, L, [ill. 35] with I as the courtyard, containing two squares. But in the middle of the left side and the right side a house such as M, N, O, P, Q, having four rooms M, N, P, Q, with O as the courtyard, containing two squares.

If it is planned in this way, the things that were said above will follow. To explain it however and first of all to speak of how the light is freely obtained, is it clear that in the corner house A, B, C, D, E, F room A

has unimpeded light on two sides both on the street; B and F can get their light in the front part from the street and from the rear from the courtyard E; then C from the street; D from the courtyard E; and likewise with the three houses standing on the other three corners. As for the house in the middle of the front side, represented by the letters G, H, I, K, L, the two rooms G and H can get their light in the front from the street and from the rear from the courtyard I; the two rooms K, L, can get their light from the courtyard I; and the same goes for the house in the middle on the rear side. Of the house in the middle on the left side shown with the letters M, N, O, P, Q, the two rooms M, Q, can get light in the front from the street; and the two rooms N, P, from the rear from the courtyard O; the same goes for the house in the middle on the right hand side. Concerning the second point, namely that every court should be so private that none of the neighbours can see in through one's windows, this is explained as follows: the courtyard E in the corner house A, B, C, D, E, F has its own façades on three sides with the windows as required; but the fourth side is a façade of the neighbour's house P, without any windows as they are not needed there, since room P gets its light from courtyard O, so that none of the neighbours can see into this garden or courtyard, nor into any windows of the house just as from there one cannot see into any other courtyards or windows. It is also clear that no thieves can enter by night without climbing over the houses. It is also clear that like-sidedness can be observed here, so that with only a small expense it will (as said above) look like a princely palace.

If one wants to plan the two middle houses on the front and rear sides one square wider the drawing will then look like this second illustration.



ill. 35



[ill. 36] Alsmen de vier houckhuysen elck van drie viercant meerder be-  
geerde, de teyckening soude daer af connen vallen als in dese derde form.

[ill. 37] Elck huys deser 4 form A, B, C, D, E, F, G, H, heeft sijn lijcksijdige  
percken. Ick neem I tot voorsael, de witte percken sonder tippelen of linien als  
vooren, sijn lichtplaetsen of hooven. Het huys H heeft noch tot hem de drie  
camers K, L, M. En het huys D heeft tot hem de drie camers N, O, P; Of het  
huys B de twe camers K, N, en het huys F de twee camers M, P, en dan het huys  
H allanelick de camer L, en [ill. 38] het huys D de camer O.

Elck perck can als vooren vry licht hebben of op de straet sijde, of op sijn  
eygen licht plaets, of op alle beyde.

Men soude de voorsijde en achtersijde des blocx als in dese vijfde form,  
oock meughen veroirdenen van gemeene burgerlicke huysen d'een sijde vande  
vyf huysen, A, B, C, D, E, d'ander vande vyf F, G, H, I, K, en daer tusschen  
twee groote Heeren huysen, het een van L tot M, het ander van N [ill. 39] tot  
O, commende haer camers by O en M ruggeling tegen malcander, en heb-  
bende elck huys twee lichtplaetsen of hoovingen.

Dese twee groote huysen souden beset en bewaert sijn vande burgherlicke en  
d'een met d'ander soo bevryt en met sulcke voordeelen als vooren gheseydt  
is.

Tot hier toe is beschreven 't geene ick op de oirdening der blocken verdocht  
had, die 't verbeteren wilde souder nader op mogen letten.

[ill. 36] If one wants the four corner houses each to have three squares more, the drawing will look like this third illustration.

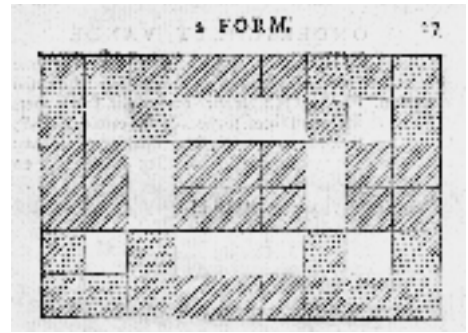
[ill. 37] Each house of this fourth illustration A, B, C, D, E, F, G, H, has its like-sided compartments. I take I to be the hall, the white compartments without dots or lines as before are courtyards or quadrangles. The house H also has belonging to it the three rooms K, L, M. And the house D has the three rooms N, O, P; or else house B has the two rooms K, N, and house F the two rooms M, P, and then house H only has room L, and [ill. 38] house D room O.

Each compartment has unimpeded light as in the previous case either from the street, or from its own courtyard, or from both.

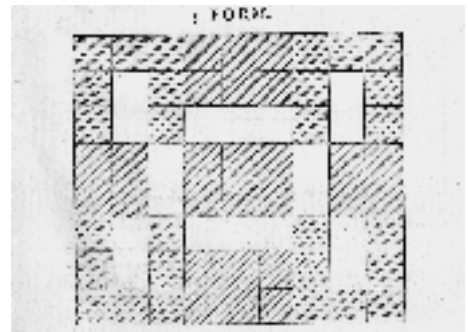
One could also plan the front and rear sides of the blocks as in this fifth illustration with common private houses on the one side being the five houses A, B, C, D, E and on the other side five houses F, G, H, I, K, and in between them two large merchant's houses, one from L to M, the other from N [ill. 39] to O, with their rooms adjoining back to back at O and M and each house having two courtyards or quadrangles.

These two large houses should be occupied and screened off from those of the ordinary citizens and in one thing and another so secure and with such advantages as was said before.

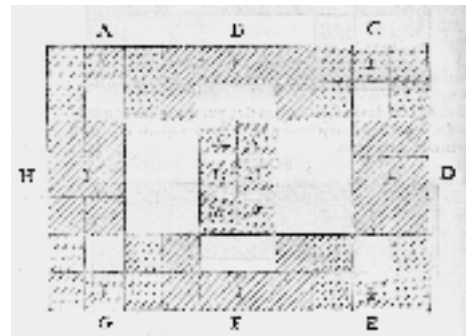
Up to now I have written my ideas concerning the layout of blocks, anyone who wants to improve on it should pay close heed.



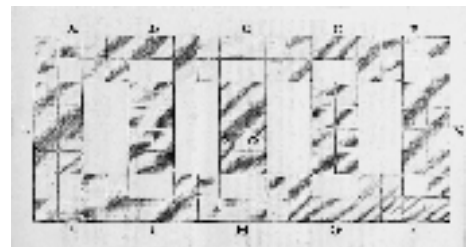
ill. 36



ill. 37



ill. 38



ill. 39

Vande vervougingh der camers of percken en ander noodtlickheden die t'samen het heel Huys maken.

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 60-65

Eer ick totte sake comme, wil te vooren segghen myn meyning niet te wesen, dat dese oirdening alle man, of an veelen, of an luttel ghevallen sal, of dat ick selfs die altijd de beste sal achten; Maer wel dit datse na langhe overlegging en ondersouckingh, de bequaemste is, die ick als nu hebbe connen bedencken: Dienende om daer mee te verclaren hoe ick ghetracht hebbe na des 1 Hooftsticx eyghenschappen, die in huysen vereyscht worden, op dat anderen 't selve verbeterende, den huysbou<sup>55</sup> tot meerder volcommenheydt gheraken mach.

Men behoort alle sijdmueren, gevels en solders soo te veroirdenen, datse sterck sijn om groote swaerte te connen draghen; Want hoewel den Huysheer int bouwen gheen groot ghewicht daer op en denckt te brenghen, 't can daer na ghebeuren dattet hem, of ander die t'huys na hem bewoonen sullen, noodich sal sijn dat met groote swaerte te belasten, als cooren of ander goederen daermen somwijlen de huysen mee siet te gronden vallen. Ofby aldient den huysheer ongheleghen is, sulcke costen te doen, en gantschelick niet en verstaet sijn rekeningh op sulck ghewicht te maken, datmen dan ten minsten mettet gelt tottet ghebou gheschickt, verkiese de sterckste vervougingh der deelen die daer me can gedaen worden; 't Welck int ghemeen geseyd sijnde, ick sal totte saeck commen.

Het voornemen wesende een huys te verordenen, int welke ick neme ghenoech te sijn, benevens der eerden te hebben een Voorsael, met noch vier percken, dienende tot Eetcamer, Slaepcamer, Vertreckcamer, en Keucken, met dergelijcke vijf percken daer boven, als tweede verdieping, en noch sulcke vijf percken daer onder te weten de kelders: Al 't welc men begeert vande cleenste form diet vallen can, mits datmen daer in bequamelick sijn gherief mach hebben, te weten de voorsael lanck ontrent 34 voeten, breed ontrent 17 voeten elck van d'ander vier percken lanck ontrent 17 voeten, breed ontrent 21 voeten; Voorts sulcx dattet sijn Lijksijdicheydt int gheheel en oock inde ghedeelten hebbe; Dat mede vry licht hebbe, niet alleen inde groote sticken, als Salen, Keucken, Vertreckcamer, Kelders en ander camers, maer oock inde ghedeelten, als Steyghers, Contoiren, Botelrie, Cabinetkens en Heymelicken, elck met een volcommen cruyscassin; Dat van ghelijcken de Dacksolders haer vry

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<sup>55</sup> The word 'huysbou' here refers to architecture in general and not to the treatise on architecture.

On the inclusion of rooms or compartments and other necessities that together make up the whole house.

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 60-65

Before I come to the point, I first want to say that it is not my intention that this layout will please everyone, or even the majority, or a few, or that I myself will always regard it as the best; after long discussion and enquiry however it is the most convenient that I have up till now been able to conceive of: with the aim of explaining how, having demonstrated the qualities that are required of houses in Chapter 1, in order that others may improve on the same, architecture may attain greater perfection.

All the side walls, façades and attics should be so ordered that they are strong enough to bear great weight; because although the master of the house does not think while he is building that he is putting any great weight on it, it can happen afterwards that he, or another who will live in the house after him, will need to impose great weight on it, such as corn or other goods so that one sometimes sees the houses fall to the ground. Or in case it is inconvenient for the master of the house to afford such expenses and is completely unable to make his calculations for such a weight that one can at least with the money appropriate to the building, choose the strongest arrangement of parts that can be done with it; having now said this in general, I will come to the point.

The intention being to design a house, by which I consider it to be adequate, to have the hall with four other compartments, serving as dining room, bedroom, drawing room and kitchen on the ground floor, with five similar rooms above them as a second storey, and five such compartments under them namely the cellars: everything that one wants in the smallest form that can contain it, provided that one is comfortable in it as is fitting, that is the halls should be around 34 feet long and around 17 feet wide each of the other four compartments about 17 feet long, and about 21 feet wide: further it should possess like-sidedness in the whole and in its parts; that it should have unimpeded light, not only in the large rooms, as halls, kitchen, drawing room, cellars and other rooms, but also in the parts such as the stairs, offices, pantries, cabinets and privies, each with a complete cross-window; that the attic rooms should likewise have unimpeded light, not through dormer windows that look

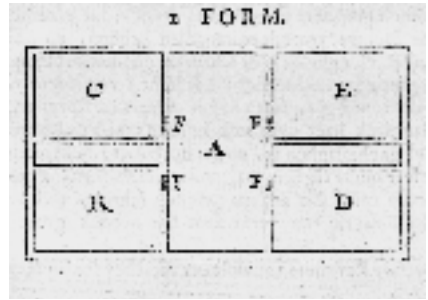
licht hebben, niet door dackveinsters dat lapwerck schijnt maer deur veinsters inde ghevels, wesende cruyscassynen ghelijck als d'ander, sulcx dat nergkens eenighe camers ontvreydt worden om licht te gheven an steyghers, ganghen of anders; Oock dat alle veinsters met volcommen Lijcksijdicheydt inde ghevels sonder eenighe dwanck, evegroot en ewewijt van malcander commen.

Soo stel ick tot desen eynde de volghende 1 form wesende [ill. 40] grontteykeningh waer in A de Voorsael bediet, hebbende over elcke sijde twee percken, te weten B de Eetcamer, C de Slaepcamer, D de keucke, E de vertreckcamer; De verbruynde plaetsen F sijn haer vier deuren, die inde Voorsael uytcommen; De twee percken tusschen B, C en tusschen D, E dienen tottet ghene hierna geseyt sal worden; De linien die dese percken vervangen, beteyckenen mueren vanden gront des kelders opgaende tottet bovenste vanden huysse teghen het dack, mackende t'samen de Lijcksijdige vierhouckighe form soomen siet.

Maer want hier noch in moeten commen steygers, schoorsteenen, portalen, contoiren, heymelicken en dierghelijcke, soo stel ick hier dese tweede form, alwaer Voorsael, Eetcamer, Slaepcamer, Keucken, en Vertreckcamer syn van beteyckening als inde eerste form A, B, C, D, E; A met dergelijcke verbruynde plaetsen 32 deuren. Voort B twee steyghers. C vier percken tot schrijfpercken, cabinetkens, botelrie, morshoeck of dierghelijcke. D vier hout en turfbacken of rammeling hoecken, E acht plaetsen tot betsteen of cassen. d'Ander percxkens syn van beteyckening als de woorden daer in staende verclaren. Wat de voorsael belanght die vereycht in heerlicke huysen ruymmer en grooter te wesen als d'ander camers, om datse dient als ghemeene plaets voor 't gheheele huysghesin, oock voor vreemdelinghen die daer met ymandt te handelen hebben, en daerom behouftse oock (ghelijck de maerckt ghemeene saemplaets der Burgherie int middel der Stadt licht) veroirdent te syn int middel vant huys, sulcx dat de camers en steyghers daer in bequamelick haer uytganck hebben; al 't welck in dese Voorsael gageslaghen is, en dat noch met Lijcksydicheydt der heele camers teghen malcander verleecken, ghelijckt voornemen was. De andere percken schijnen elck totten ghebruyck daerse toe veroirdent sijn, oock groot ghenoech.

like stopgap work but through windows in the gables, being cross-windows as in the other rooms, so that nowhere are there any rooms that are prevented from giving light to staircases, passages or other places; also that all the windows fit equally high and equally wide in the façades, without the least distortion and with perfect like-sidedness.

To this end I present the following first illustration being [ill. 40] a floor plan where A stands for the hall having on each side two compartments, namely B the dining room, C the bedroom, D the kitchen, E the drawing room; the shaded-in places F are its four doors that give access to the



ill. 40

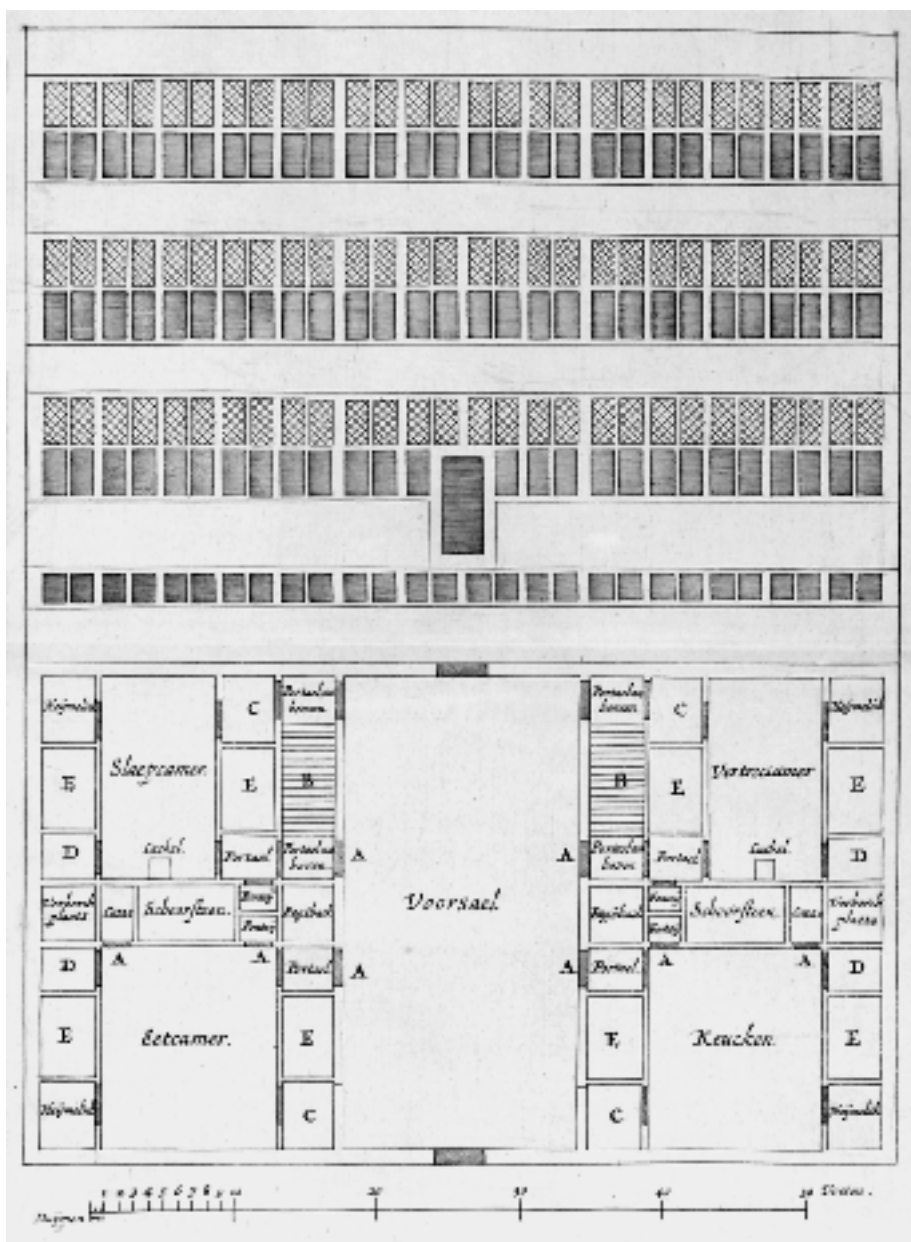
hall; the two compartments between B, C and between D, E serve the purpose that will shortly be told; the lines that indicate these compartments, represent walls rising from the bottom of the cellars to the highest part of the house up against the roof, together making the like-sided square form as one can see.<sup>57</sup>

But because staircases, chimneys, doorways, offices, privies and suchlike must also be included, I present this second illustration here, in which A, B, C, D, E represent the hall, dining room, bedroom, kitchen, and drawing room as in the first illustration; A with similar shaded-in places 32 doors. Further B stands for two staircases. C four compartments for study, cabinet, pantry, scullery and the like. D four boxes for wood or peat or dairy, E eight places for box-beds or cupboards. The other compartments represent what the words in them state.<sup>58</sup> As far as the hall is concerned this is required to be broader and larger in stately houses than the other rooms, so that it can serve as a common place for the whole household, and also for strangers who have dealings with someone there and therefore it also needs (just as the market the common meeting place of the citizens lies in the middle of the town) to be situated in the middle of the house, so that the rooms and staircases exit onto it in proper fashion; all of which can be observed in this hall, and also with like-sidedness of whole rooms when compared with each other, as was intended. Each of the other compartments seem also to be large enough for the use for which it was planned.

<sup>57</sup> Compare the drawing and the summary of this passage and the following one in Isaac Beekman's commentary, 'Journael', fol. 225v. line 28-fol. 226r. 16.

<sup>58</sup> Originally these were presumably in the 'second illustration' only represented by letters, see chapter 5





ill. 41



Angaende steyghers vanwelcker verscheydenheydt en eyghenschappen in den Huysbou gheseyt is , daer toe heb ick hier [ill. 41] de steecksteyghers met eenvaerdighe climming, dat's van heele verdiepingh vercoren, welcker hier twee Lijksijdelick veroirdent sijn, hebbende elck tot vry licht (so inde stanteyckeningh der ghevel daer by ghestelt nader blyct) een cruyscassyn, en is te verstaen datter sulcke drie steygers boven malcander commen: Maer want ymandt moch vragen oft met een steygher, byde Slaepcamer niet genoeg en soude sijn, sonder daer toe noch een te maken by, hier op dient tot antwoordt, dat wesende benevens de Slaepcamer, een steygher soo can de selve mette steyghers dieder noch onder en boven commen, eyghentlick dienen voor den Heer, tot sulcken eynde als int volghende 5 Hooftstick sal gheseyt worden, d'ander steygher voor 't ghemeen huysghesin: Ten anderen gebeuret dickwils dat huysen in twee deelen by verscheyden huysgesinnen bewoont worden, in welcken ghevalle het voughelick is, elck syn eyghen steyghers te hebben, sonder d'een des anders wooningh te ontvreyen: Merckt noch dat d'een steygher hier nevens de keucken gerievich is, om telckens alst noodich is van daer na de kelder te gaen: Belanghende heymelicken, contoiren, cabinetkens, morshoecke en diergelijcke die hebben volghens 't voornemen oock haer vrylicht, te weten elck een cruyscassyn, soo inde Stanteyckeningh te sien is.

't Gebeurt dickwils datmen een huys veroirdent om daer in te wonen een Edelman, Rentier, Amptman<sup>56</sup> of een die gheen nering en doet, ghelijck mette boveschreve teyckening voorbeeltsche wijze gheschiet is, nochtans daer na van ymant nering doende bewoont moet worden, als van een Cramer, Coopman, Ambachtsman of herbergier, 't welck alst daer toe onbequaem is, streckt tot ongherief der ghener dieder in wonen, oock tot achterdeel der eyghenaers, dat niet connende soo hooch verheuren of vercoopen als sy anders wel souden, of moest vermaect wesen. Maer dese form, en heeft dat ongheval niet te verwachten om dese redenen: By aldient waer een Cramer, Coopman, Ambachtsman of een die wijnckel doet, 't isser bequaem toe, deur dien de Sael met d'ander twee nevenstaende percken, die an straet commen, veel veynsters hebben na den eysch van wijnckels: Inde Comtoiren comt oock vry licht, connende soo wel dienen tot wijnckels als tot comtoiren; De cassen op elcke sijde

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<sup>56</sup> Erroneously: 'Amhachtsman'.

Concerning the staircases the variety and qualities of which are described in *Huysbou*<sup>59</sup> I have preferred here [ill. 41] the straight staircases with an even height that is of whole storeys, with two of them here planned like-sidedly, each with a crossbar window (as appears later on in the elevation of the façade) for unimpeded light, and it should be understood that three of these staircases come one above the other: but since someone might ask whether it would not be enough with one staircase leading to the bedroom, without adding another one as well, the answer is, that a staircase next to the bedroom can, together with the staircases that lead above and below, serve for the master in such a way as described in the following fifth chapter, with the other staircase for the general household:<sup>60</sup> furthermore it often happens that houses are lived in in two parts by separate families, in which case it is proper that each should have his own stairs, without the one intruding on the dwelling of the other: it should be noted that a staircase next to the kitchen is convenient here, so that one can constantly go from there to the cellar when needed: concerning privies, offices, cabinets, sculleries and the like these have according to our intentions also their own unimpeded light, namely each one a cross-bar window, as can be seen in the vertical elevation.<sup>61</sup>

It often happens that one orders a house for a nobleman or rentier, official or someone who does no trade, as is shown in exemplary fashion in the above-described illustration, and yet afterwards it has to be occupied by someone who is in trade, such as a peddler, trader, artisan or innkeeper, which because it is unsuitable for them is inconvenient for everyone who lives in it, also to the disadvantage of the owners that they cannot charge so high a rent or sell it as they would do otherwise, or else it has to be converted. But this disadvantage is not expected with this design for these reasons: it is suitable for a peddler, trader or artisan or someone who is a shopkeeper, since the hall with the other two rooms next to it that front on the street have many windows as is required for a shop: in the offices too the light can enter unimpeded, so that they can serve just as well for shops as for offices; the cupboards on each side of the rooms

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<sup>59</sup> Allusion by Hendrick Stevin to his proposed *Huysbou*, it is not impossible however that in the original *Huysbou* texts Simon Stevin was referring here to the chapter about the 'steygers' or staircases. See appendix E, Notes on the unfinished *Huysbou*, p. 494: H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening, Hoofstick 4*, p. 62.

<sup>60</sup> The reference is by Hendrick Stevin to his own work; it is not impossible however that in the original *Huysbou* texts Simon Stevin referred to this part of the chapter with another system of numbering. It concerns the next part of the chapter. See appendix E, Notes on the unfinished *Huysbou*, p. 494: H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening, Hoofstick 4*, p. 63.

<sup>61</sup> In a note by Hendrick Stevin that follows here it appears that in the preceding '2nd illustration' the kitchen was situated in the place of the 'drawing room'. See too appendix references to his proposed *Huysbou, Byvough der Stedenoirdening, Hoofstick 4*, p. 63.

der camers dienen om coomschap in te sluyten na Cooplien ghebruyck: Voor een herberch heeft elck der vier percken nevens der eerden, met derghelijke vier daer boven, sijn twee betsteen of plaetsen daer toe dienende, en elck haer heymelick en contoir, bequaem voor reysende lieden, om daer in te schrijven en op te sluyten, 't ghene men voor yghelick inde camer commende, niet en begheert te laten bloot legghen; De twee groote salen, d'een boven, d'ander beneen, connen dienen tot maeltijden van veel volcx; Den Weert mach een camer voor hem eyghen houden, met groote vryhey, sonder dat ymant der ghelogeerde, daer door behouft te gaen om in sijn camer te commen.

Een camer alsoo alleen ghemaect, soude connen dienen, om daer in met ghemack en bequaemhey te woonen.

#### MERCKT.

Die de verdeeling deser camerpercken niet an en stonde maer de camers liever soo veel ruymmer begheerde, souder die, of soo veel alsser hem te veel docht, moghen uytlaten.

VII.4 VAN DE VERKIESINGE DER CAMERS OF PERCKEN, ELCK TOT HAER GEBRUYCK MET INSICHT DOOR WELCKE DAT MEN BEQUAMELICK GAEN MACH OF BEHOORT TE GAEN OM TOT DE ANDERE TE COMEN EN WELCKE NIET.

Deur welcke camers of percken datmen bequamelicxt gaen mach, om tot d'ander te commen, deur welcke niet.

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 65-71

De percken van een huys gheteyckent sijnde, soo rester te overlegghen, tot wat ghebruyck men die bequamelick veroirdenen sal, waer in te anmercken staet, deur welcke men bequamelick gaen mach of behoort te gaen, om tot d'ander te commen, deur welcke niet: Om hier af by voorbeelt te sprecken, genomen datter sy een burgherlick huys (vant welck ick eerst segghen sal, daer na van Vorstelicke) hebbende nevens der eerden vijf percken, als een Voorsael, Vertreckcamer, Eetcamer, Slaepcamer, en keucken, als mette formen des voorgaenden 4 Hoofsticx angewesen wort, Om hier mee het voornemen te verclaren, te weten door welcke percken datmen bequamelick gaen mach, om tot d'ander te commen, deur welcke niet, soo is te weten, datmen om van buyten inde Voorsael te commen, deur gheen der vier ander en behoort te lijden,

serve to contain goods as is customary with merchants: in the case of an inn each of the four compartments on the ground floor, with a similar number of four above, has two box-beds or places serving as such, and each one has its own privy and office suitable for travellers, to write in and keep those things locked up that one does not want anyone entering the room to see; the two large halls, one above, one below, can serve for meals for many people; the host may keep a room for his own, with great freedom, without anyone of the lodgers, needing to go through it to come to his own room.

Only if a room is made in this way, would it serve, to live in with comfort and pleasure.

#### NOTE.

Anyone who did not like the layout of these compartments but preferred his rooms to be much larger, could leave out those or as many as he thought too many.<sup>62</sup>

VII.4 ON THE CHOICE OF ROOMS OR COMPARTMENTS, EACH TO ITS OWN USE WITH AN ACCOUNT OF WHICH ONES ONE MAY PROPERLY GO THROUGH TO REACH THE OTHER ONES AND WHICH NOT.

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 65-71

Once the compartments of a house are drawn, it remains to be discussed, the way that one can conveniently order them, paying special attention to the question of which rooms one may properly go through to reach the other ones, and which not: to give an example here, assuming that it is a private house (that I will speak of first, and then of a princely one) having on the ground floor the first five compartments, such as a hall, drawing room, dining room, bedroom and kitchen, as shown in the illustrations in the preceding fourth chapter,<sup>63</sup> to explain my intention here, namely through which rooms one may properly go through to reach the others and which not, it should be realised, that to enter the hall from outside, one should not have to go through any of the four other

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<sup>62</sup> From a note by Hendrick Stevin here it appears that the ‘disposition of rooms and compartments’ was incomplete. See appendix E, Notes on the unfinished *Huysbou*, p. 494: H. Stevin *Materiae Politicae, Byvough der Stedenoirdening, Hooftstick 4*, pp. 64-65.

<sup>63</sup> The reference is by Hendrick Stevin to his own work; it is not impossible however that in the original *Huysbou* texts Simon Stevin referred to this section of the chapter with a different system of numbering. It concerns the previous chapter. See appendix E, Notes on the unfinished *Huysbou*, p. 494: H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening, Hooftstick 5*, p. 65.

maer wel deur de Voorsael, na elck van dien; Want nademael de Voorsael dient voor ghemeene plaets des heelen huysghesins, oock voor vreemde luyden van buyten commende, om daer in met ymandt vanden huysse te sprecken, soo en voughet niet datmen, om tottet selve te commen, soude moeten gaen deur de vertreckcamer, daer den Heer vanden huysse met ymandt alleen spreeckt, noch door de Slaepcamer daer den Heer of sijn Vrou noch opt bedde mocht legghen, of deur de Eetcamer daermen an tafel mocht sitten, noch oock daer mee de keucken te ontvrijen: Maer wil de Voorsael so veroirdent syn als gheseyd is, datmen daer deur vryelick tot al d'ander mach gaen. Belanghende de Eetcamer, 't is bequamer daer deur te gaen na de Slaepcamer, dan verkeert deur de slaepcamer na de eetcamer op dat de ghene die dagelicx an tafel commen, en dickwils daer te doen hebben, den Heer of sijn Vrou die deur sieckte of ander oirsaeck opt bedde mochten legghen, niet hinderlick en sijn. Deur de keucken na de botelrie te gaen, schickt beter dan verkeert deur de botelrie na de keucken, om dat inde botelrie te bewaren staen dinghen die meer bevreyt willen sijn, te weten al 't gene men daghelicx totte tafel behouft, als ammelakens, servetten, hantdoecken, tin of silvere schotelen, teljoren, soutvaten, lepels, lampetten, candelaers, keersnuyters, tafel messen, vorcken, kannen, flesschen, drinckglazen, schalen, bekens en diergelijcke, diemen (als geseyd is) daghelicx totte tafel behouft, want 't ghene men selden besicht, als de groote menichte van ammelakens, servetten en hantdoecken, voort silverwerck datmen alleenlick gebruyckt op bancquetten, of datmen hout voor juweelen of rijckdom, s'ghelijcx besonder drinckglazen, posseleynen &c: die en legtmen niet inde botelrie, maer in ander cassen buyten de keucken. Soo oock deur keucke na de morshoeck te gaen past beter dan verkeert deur de morshoeck na de keucken, om datmen inde morshoeck, om ander plaetsen niet te ontvreyen, het vuyl werck doet, als vaten wasschen, tin en yserwerck scheuren, lywaet wasschen, schoenen swarten met diergelicke; In dese morshoeck sijn twee pompen, d'een van putwater, d'ander van reghenwater; Daer worden inghestelt coockpotten, haer decksels, pollepels, speten, braetpannen, hack messen met diergelijcke: 't Is oock gerievich voor den Heer, dat hy de camer boven sijn slaepcamer, mitsgaders het kelder deel daer onder hebbe tot sijn eyghen verdoen, sonder dat ymant daer deur moet lyden, om tot ander percken te commen, ghebruyckende het kelder deel tot gelt, juweelen en sulcke dingen die vochticheyt verdragen mogen, en diemen heymelick en sekerlick bewaren wil; De bovecamer tot boecken, papieren of ander dinghen die drooghe moeten blijven, en die hy voor de hant vant gemeen huysgesin niet en wil laten legghen. Waer me hy oock bevreyt is voor 't gerucht dat ander boven sijn hoofd soude mogen maken, oock voor de ghene die deur een gaetken inde solder souden connen sien, wat hy in sijn camer maeckt; Ende de steyghers wel veroirdent sijnde als vooren, can alsoo in sijn besonder gedeelte commen tottet bovenste en onderste vant huys, sonder

rooms, but rather through the hall to each of them; because seeing that the hall serves as a general place for the whole household, also for strangers coming from outside, to speak there to someone of the house, so it is not suitable that, to come to the same, one should have to go through the drawing room, in case the master of the house is speaking alone with someone, nor through the bedroom in case the master or his wife are still lying in bed, or through the dining room in case people are sitting at the table, nor also to intrude on the kitchen in this way: but let the hall be situated as has been said, so that one can freely go through it to all the other ones. Concerning the dining room, it is more convenient to go through it to the bedroom, than the other way round through the bedroom to the dining room so that those who come to the table every day, and often have dealings there, should not disturb the master or his wife who through sickness or other cause may be lying on the bed. To go through the kitchen to the pantry, is more suitable than the other way round through the pantry to the kitchen, because things are kept in the pantry that need to be more protected, namely all those things one needs for the table every day, such as tablecloths, napkins, towels, tin or silver dishes, meat dishes, salt cellars, spoons, water jugs, candlesticks, candle snuffers, table knives, forks, jugs, bottles, glasses, plates, goblets and the like, that one (as said before) needs for the table every day, since that which one rarely uses, such as the great quantity of tablecloths, napkins and towels, silver ware that one only uses for banquets, or that one keeps as jewels or treasure, such as special glasses, porcelain etc: one does not put these in the pantry, but in other cupboards outside the kitchen. So too it is more suitable to go through the kitchen to the scullery, than the other way round through the scullery to the kitchen, because, in order not to intrude on other places, one does the dirty work in the scullery, such as washing dishes, scrubbing tin and ironware, washing linen, blackening shoes and such like; in this scullery there are two pumps, one of groundwater, the other of rainwater; this is where the cooking pots and their lids are set, ladles, spits, frying pans, carving knives and the like: It is also convenient for the master that he has the room above his bedroom together with the cellar section under it for his own dealings, without anyone having to go through there to get to other compartments, using the cellar partly for money, jewels and such things that can endure damp, and which one needs to keep secretly and securely; the upper room for books, papers or other things that have to remain dry, and that he does not want to be within reach of the general household. In this way he is also not bothered by any noise that other people might make above his head, nor by anyone being able to see through a hole in the attic, what he is doing in his room: And the stairs being well laid out as said before, can also go through his own separate part from the top to the bottom of the house, without going

door eenighe ander camers te commen en van ymant ghesien te wesen, oock sonder ymandt ander daer te commen dan die hy der last af geeft.

Belanghende Vorstelicke huysing, laet tot verclaring van dien in dese grontteyckening de ses vierhoecken A, B, C, D, E, F, licht plaetsen bedien, met haer omme staende huysingen, die altemael haer vry licht hebben, welcker verdeling dusdanich is.

De lichtplaets A met haer omstaende huysinghen is [ill. 42] voor de wacht der Crijchslieden.

De lichtplaets B met haer omstaende huysing is voor de stallen en jacht, mettet volck dese selve angaende.

De lichtplaets C met haer omstaende huysing voor de hofdiensten en 't volck dien angaende, welke hofdiensten ghemeenelick sijn keucken, pasteybackerie, brootbackerie, corenmolen, brouwerie, groote spijswaert,<sup>57</sup> cleyne spijswaert,<sup>58</sup> botelrie, wijnkelder, bierkelder, brantkelder, wasscherie, apotekerie, siecken camer en sulcke alsser een welghestelt hof na sijn gheleghentheydt meer mocht hebben.

De lichtplaets D met haer omstaende huysing voor den Vorst.

De lichtplaets E met haer omstaende huysing voor de Vorstinne en haer Vrouwen.

De lichtplaets F met haer omstaende huysing voor den Forstraet, Rekenkamer en vreemde Heeren, mettet volck daer toe ghehoorende.

G de kerck.

Voort is in de huysing van yder lichtplaets B, C, D, E, F een groote sael als H, I, K, L, M.

N is de voorpoort en des huys eenige incomst.

O, P, Q, R, S, T, V, sijn ganghen om van d'een lichtplaets tot d'ander te commen.

De reden deser verdeeling is met dusdanich insicht:

De wacht vant Crijchsvolck is billichlick ande incomst, mette ruyme plaets A ghescheyden van d'ander ghedeelten.

Peerden en waghens sijnde inghecommen door den ganck O, keeren van daer ter slinckerhandt, na den ganck P, sulcx dat al 't ghene den stal en jacht<sup>59</sup> angaet, daer by malcander vergaert, sonder ander plaetsen daer me te ontvryen: Oock is de vuylicheydt en mishaghelickheydt vandien, buyten 't ghesicht der ghene die gaen na de logysten des Vorsts, Vorstinne en Vorstraets: 't Gherucht

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<sup>57</sup> In the margin: 'Magasyn'.

<sup>58</sup> In the margin: 'Gardemanghe'.

<sup>59</sup> Erroneously: 'Jasht'.

through any other rooms and being seen by someone, also without anyone coming there other than someone who is delivering goods.

Concerning princely accommodation, let the six squares A, B, C, D, E, F, in this ground plan being the courtyards, serve as an explanation of this, with their surrounding quarters, all with their unimpeded light, the division being as follows.

Courtyard A with its surrounding quarters is [ill. 42] intended for the military guard post.

Courtyard B with its surrounding quarters is for stables and the chase, with the people responsible for the same.

Courtyard C with its surrounding quarters is for the court services and the people responsible for the same, in general these services consist of

kitchen, pastry cooks, bakery, corn mill, brewery, large larder, small larder, pantry, wine cellar, beer cellar, fuel cellar, laundry, apothecary, sick bay and more such things that as a well ordered court according to its circumstances should have.

Courtyard D with its surrounding quarters for the prince

Courtyard E with its surrounding quarters for the princess and her ladies.

Courtyard F with its surrounding quarters for the counsellors, exchequer and foreign envoys, with the people pertaining to it.

G the chapel

Furthermore there is in the quarters of each courtyard B, C, D, E, F a great hall H, I, K, L, M,

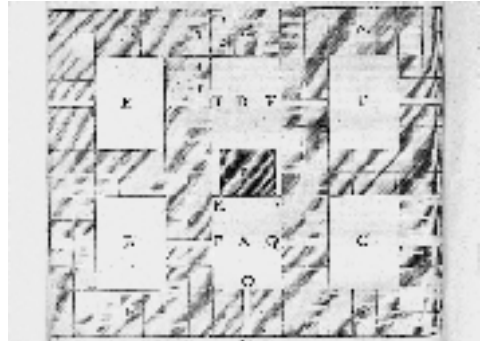
N is the front gate and the only entrance to the house.

O, P, Q, R, S, T, V, are passages leading from one courtyard to another.

The reason for this layout is with this in mind:

The guard post of the soldiers is properly situated at the entrance, with the spacious square A separate from the other parts.

Horses and carriages having entered by way of the passage O, turn from there to the left through the passage P, so that those who are responsible for the stables and the chase can be quartered there without intruding on other places: also its filth and unpleasantness, can be kept out of sight of those who go to the lodgings of the prince, princess and counsellors: the noise of the



ill. 42



der peerden en des volcx diese bestellen, in die plaets besloten sijnde, en wort in d'ander niet ghehoort.

Alle dinghen der hofdiensten inghecomen of ingebracht sijnde door den ganck O, keeren van daer ter rechterhandt na den ganck Q, al waer 't ghene de hofdiensten angaet, by malcander vergaert, sonder ander plaetsen daer mee te ontvryen: Oock is vuylicheydt en mishaghelickheydt vandien buyten 't ghesicht der ghener die gaen na de logysten des Vorsts, Vorstinne en Vorstraets, 't gherucht des volcx der hofdiensten in die plaets besloten sijnde, en wert in d'andere niet ghehoort.

De kercke G is bequamelick int middel vant huys, met twee ganghen daer nevens als R en S, om daer door te commen uyt de lochtplaets A inde lochtplaets D. Alle de ghene die by den Vorst of in sijn oirt te doen hebben, ghecommen sijnde deur den ganck O, gaen van daer nae den ganck R, of S, sonder vande vuylicheydt of gheruchten des stals of der hofdiensten verhindert te sijn; daer deur ghecommen sijnde, inde lochtplaets D, des Vorsten oirts, moghen keeren op den slijnckerhandt na den ganck, T, om te gaen na den oirt der Vorstinne met haer Vrouwen, of op den rechterhandt na de ganck V, om te commen na den oirt des Vorstraets, Rekencamers en vreemde Heeren.

De salen H, I, K, L, M welcker de lichtplaetsen B, C, D, E, F elck een hebben, sijn ghemeene percken om 't volck van dien in te moghen t'samen commen eten en hun gherief nemen.

Angaende d'oirden der besonder percken in des Vorsts oirt, die mach dusdanich sijn: Om vande ghemeene voorsael K te commen tot des Vorsts slaepcamer, salmen<sup>60</sup> eerst lijdē deur de Hallebaerdiērs wacht; van daer deur de Edelluyden, Pagen en Camerlinghen wacht; van daer door des Vorsts Eetcamer; van daer deur de vertreckcamer of praetcamer; van daer inde slaepcamer. 't Is oock voughelick de oirden sulcx te wesen, dat den Vorst mach commen uyt sijn slaepcamer inde Vorstinnens slaepcamer, altijdt alst hem ghelieft, sonder van ymandt des huysghesins ghesien te wesen: Maer om 't ghene van dies tot hier toe gheseydt is, in de form an te wijsen, soo laet 1 beteyckenen de camer daermen uyt de sael K eerst incomt, te weten de Hallebaerdiērs wacht, 2 de wacht van de Edelluyden, Pagen en Camerlinghen, 3 des Vorsts eetcamer, 4 de vertreckcamer of praetcamer, 5 des Vorsts slaepcamer, 6 des Vorstinnen slaepcamer, gheleghen in haren oirt, en soo dat den vorst uyt sijn slaepcamer 5 daer in can commen, sonder van ymant des huysghesins ghesien te wesen.

Ick versta oock 't ghene boven vanden Heer eens Burgerlicx huys gheseydt is, plaets te houden voor den Vorst en Vorstinne, te weten dattet voor hemliē gerievich is, datse de camers boven haer slaepcamers, mitsgaders de kelder

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<sup>60</sup> Erroneously: 'salmeu'.

horses and the people who take care of them being contained in this place, it is not heard in the other parts.

All the things for the court services having arrived or having been delivered through passage O, turn right there through passage Q where those responsible for the court services are quartered, without thereby intruding on other places: also its filth and unpleasantness, can be kept out of sight of those who go to the lodgings of the prince, princess and counsellors: the noise of the people of the court services being contained in this place, it is not heard in the other parts.

The chapel G is situated conveniently in the middle of the palace with two passages on its sides namely R and S, to get there from courtyard A and courtyard D. All those who have dealings with the king or in his residence, having entered through passage O, go from there to passage R or S without being bothered by the filth and noise of the stables or court services; having reached courtyard D of the prince's residence, can turn left through passage, T, to reach the residence of the princess with her ladies or on the right of the passage V, to come to the quarters of the counsellors, exchequers and foreign envoys.

The halls H, I, K, L, M, each of them having one of the courtyards B, C, D, E, F, are general compartments where the people who belong there may meet to eat and take their pleasure.

Concerning the layout of the special compartments in the prince's residence, they may be as follows: to reach the prince's bedroom from the general hall K, one shall first go through the halberdier's guard post; from there through the antechambers of the noblemen, pages and chamberlains; from there through the lord's dining room; from there through the drawing room or parlour; from there into the bedroom. It is also proper for the layout to be such that the prince can go from his bedroom to the princess's bedroom, always when he likes, without being seen by anyone of the household: but to point out in the illustration what has been said here, let 1 stand for the room that one first enters from K, namely the halberdier's guard post, 2 the antechamber of the noblemen, pages and chamberlains, 3 the prince's dining room, 4 the drawing room or parlour, 5 the prince's bedroom, 6 the princess's bedroom, situated in her quarters, so that the prince can go from his bedroom into it without being seen by anyone of the household.

I understand that what has been said above of the master of a private house, also holds good for the prince and princess, namely that it is pleasant for them, that they have the rooms above their bedrooms, with the cellars below for their

deelen daer onder, hebben tot haer eyghen verdoen, mette steyghers soo veroident, dat sy in dat besonder ghedeelte moghen commen tottet bovenste en onderste vant huys, sonder van ymandt ghesien te wesen, alles tot sulcken ghebryuck en eynde als daer breeder gheseydt is: Noch soudemen hier moghen beschrijven den bequamen ganck vande onderste camers na de bovenste, en vant ongherief datter volght deur oirdeningh der Loooven d'een boven d'ander; maer want daer af eyghentlick verclaringh ghedaen is in 't 3 Hoofdstick deses Byvoughs, soo salt daer me ghenoech sijn.

Merckt noch dat hoewel meerder of minder Vorstelicke huysen, dan 't gheene hier tot voorbeelt ghenomen is, ander oirdeningh der ghedeelten soude vereyssen dan dese; doch soo is myn meyningh, van 't gheene daermen na behoort te trachten, daer mee ghenoech int ghemeen verclaert, te weten deur welcke percken datmen bequamelick gaen mach om tot ander te commen, deur welcke niet.

Hendrick Stevin observes here that his father had also wanted to describe a 'princely house with all its assembly rooms', with the meeting rooms and quarters for counsellors and envoys grouped around courtyards. He transferred all the matters concerning the palace that were not raised in the *Stedenoirdening* to the first chapter of 3 *Onderscheyt van de Radenoirden in Materiae Politicae*

Vorstelick huys met al sijn vergaringhen

H. Stevin, *Materiae Politicae, III Onderscheyt van den Raden Oirden*: p. 57

Merckt

'Nadien ick tot hier toe gheseydt heb van d'oirden der Camers in 't ansien van haer verscheyden stoffen en trappen, so sal icker noch wat by vougen, van haer oirden int ansien der plaetsen, soomense ten meesten oirboir soude meugen bouwen, 't welck is [alst om ander oirsaecken niet gelaten en moest worden] dat alle opperste Werckraden die onder den vorst ongemiddelt staen, soudent al t'samen sijn inde selve Stad daer den Vorst gemeenlickxt sijn Hof houdt: en alsment al mocht veroirdenen na zijn wil, ic soude het vorstelick hof, met de voorschreven Kamers vervanghen in een groot gesticht, al an malcander om daer in te woonen allede Amptlien der selver Camers of vergaringen met wijf ende kinderen, en dit om seven voornamelicke oirsaken: Ten eersten: dat al de opperste camers of raden daer den vorst dickwils mee te doen hefft, aldus voor den Vorst en oock voor malcander ghereet by der hant sijn, sonder met tijdtverlies uyt andere Steden verre van daer te moeten ontboden worden, daer mee den tijdt lange anloopt eermen tot besluyt commen can: ten tweeden

own dealings, with the staircases so ordered that they can go to the top and the bottom of the house in that separate part without being seen by anyone and that they shall have everything for such uses and ends as was said there in more detail: moreover, the convenient passages from the lowest to the highest rooms can be described here, and the inconvenience that comes from placing the Galleries one above the other; but because this has already been explained in the third chapter of this appendix, let this be enough here.

Let it be noted however that although princely houses that are both larger and smaller than that which is taken as example here, would require other layouts of the parts than this one; even so it is my opinion that I have on the whole explained enough about that which needs to be dealt with, namely which compartments one may properly go through to reach the other ones and which not.

Hendrick Stevin observes here that his father had also wanted to describe a 'princely house with all its assembly rooms', with the meeting rooms and quarters for counsellors and envoys grouped around courtyards. He transferred all the matters concerning the palace that were not raised in the *Stedenordening* to the first chapter of *3 Onderscheyt van de Radenoirden in Materiae Politicae*<sup>64</sup>

Princely palace with all its assembly rooms

H. Stevin, *Materiae Politicae, III Onderscheyt van den Raden Oirden*: p. 57

Note

'Now that I have spoken about the layout of rooms with regard to their different matters and degrees of importance, I should still add something about their order with regard to site, where it is most appropriate to build, which is (even were there no other reasons why it should be omitted) that all the highest councils that hold sway immediately under the ruler, should be all together in the same town where the prince generally holds court: and if one could order things as one wanted, I would accommodate the royal court, with the chambers as described above in a great building all together, in which all the officials, wives and children can live with their own rooms or quarters, and this for seven main reasons: first, that all the highest chambers or counsels that the king often has dealings with, should thus be readily available for the king and also for each other, without having to be summoned with loss of time from other distant towns, since it then takes a longer time before one can come to

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<sup>64</sup> See appendix E, Notes on the unfinished *Huysbou*, p. 494: Hendrick Stevin *Materiae Politicae, Byvough der Stedenordening, Hooftstick 5*, p. 72.

schoutmen daer mee de moeyt en groote costen van 't geduerlic over en weer reysen. ten derden commen de Vorstraden aldus gheduerlick beter het ooghe hebben, op haer ongemiddelde raden alsoo dagelicks by derhandt sijnde. ten vierden oude Raedsheeren vallet becommerlick tweemaal s'daeghs ten hoove te commen, verre van daer inde Stad woonende: Ten vijfden nieuwe ancomende Amptlien van buyten incommende, en connen dickwils metter haest gheen bequam huys te huer vinden, sulcx datse moeten hueren al te costelick of minder als haer gedaente vereyscht: ten sesten sulcken groot ghesticht soude wel veel costen, maer misschien niet so veel als de huysen die sy anders bewoonen soudent: Ten sevenden men geeft hemlien soveel te minder gagie.'

Vant open en toegaen der deuren, mitsgaders ghedachtenissen op sloten en sleutels.

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 72-74

Het openen en toegaen der deuren en schijnt niet soo bequaem na de sijde der camers als over d'ander sijde inde portalen, contoiren,<sup>61</sup> heymelicken en diergelijcke, om verscheyden redenen: Ten eersten dat de camers met tapijtserie behanghen sijnde en de deuren daer in open gaende, soo schrappt de bovecant der deuren teghen de tapijtserie, met ongherief der ghene die uyt en in gaen, 't welck soo niet en gebeurt, wanneer de deure over d'ander sijde opengaet: Ten tweeden de deuren openstaende en datter dan voor de selve gheen tapijt en hanght, die het gat bedeckt, dat is oock mishagelicker als na d'ander wijze, daer de tapijt altijd voort gat hanght: Ten derden dat de deuren inde camer opengaende, belet doen ant ghene datter in is, inden halven omtreck door de deur beschreven, als menschen daer sittende of yet anders daer in staende, 't welck over d'ander sijde soo niet en ghebeurt.

Ghedachtenissen Op Sloten en Sleutels.

Men can maken 6 gelijcke slooten met een gemeente sleutel die de selve altemael can open doen.

Voort canmen maken dertich sloten elck met een besonder sleutel die elck haer slot connen open doen, maer en connen d'een des anders slot niet open doen noch oock een vande voorschreve ses sloten, connende nochtans die ghemeene sleutel open doen alle de sessendertich sloten.

Deur dit middel can den Heer vanden huysen alleenlick met een ghemeene sleutel openen alle de 36 sloten vanden huysen, sonder dat een vande 30 besonder sleutelen sijn 6 sloten can open doen.

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<sup>61</sup> Erroneously: 'contoireu'.

a decision: secondly with this one spares the trouble and great expenses of constantly travelling back and forth: thirdly the king's counsellors can thus constantly keep better eye on their immediate advisors since they are at hand every day. fourthly for old counsellors it is burdensome to have to come to the court twice a day, living far away in the town: fifthly newly arrived officials coming from outside, can often with the haste involved not find any proper house to rent, so that they have to rent something that is too expensive or inferior to that which their standing requires: sixthly a large building such as this would certainly cost a great deal, but perhaps not as much as the houses that they would otherwise have to occupy: Seventhly one could give them less wages accordingly.'

On the opening and closing of doors, with reflections on locks and keys  
H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 72-74

It appears to be not so convenient to open and close the doors on the room side as on the other side in the porches, offices, privies and the like, for various reasons: firstly that the rooms being hung with tapestries and the doors opening onto them the tops of the doors then scrape against the tapestries, making it inconvenient for anyone going in or out, which does not happen if the door opens on the other side: secondly if the doors are open and there is no tapestry hanging in front of the same, that covers the opening, this is also more disagreeable than the other way, by which the carpet always hangs in front of the opening: thirdly the doors opening in on the room, are a hindrance to anything in it, in the half circle described by the door if people are sitting there or if something else is placed there, which does not happen on the other side.

#### Reflections on locks and keys

One can make six similar locks with a common key that can open all of them.

Furthermore one can make thirty locks each with a separate key each of which can open its own lock, but the one key cannot open the other lock nor one of the six locks just described, nonetheless this common key is able to open all thirty-six locks.

By this means only the master of the house is able to open all the 36 locks in the house with a common key, without one of the thirty separate keys being able to open his own 6 locks.<sup>65</sup>

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<sup>65</sup> Cf. the drawing and the summary of this and the following passage in Isaac Beeckman's commentary, 'Journael', fol. 225 line 28-fol. 231r. 6-7.

't Welck bequaem is voor een Huysvaer die ses verscheyden sluytende plaetsen heeft, daer in hy niet en wil dat ymandt comme dan hy; Als een comtoir, gheltkiste, een silvercasse, een Juweelcasse, een casse daer hy brieven van belanck inleghet als opdrachten van huysen en Landen en ander secrete brieven, voort een boeckcamer, of sulcx alst wesen mocht, daer hy niet en wil dat ymandt anders by comme.

Maer het ghebeurt dat sijn Huysvrouw heeft een lijnwaetcasse, een cleercasse, haer eyghen Iuweelcasse van braseletten, rijnghe, goude ketens, peerlen en dierghelijcke, daer sy niet en wil dat ymandt anders by comme dan sy. In sulcken ghevalle mach sy doen maken een slot en en sleutel die alle d'ander sloten open doet, sonder de voorschreve 6, en sulcx dat gheen vande ses-en-dertigh de hare open can doen.

Maer wanttet ghebeurt dat den Heer de sleutel van syn comtoir gheeft an eenighe dienstbode, om yet daer uyt<sup>62</sup> te halen, en dat de selve dienstbode dan een toeganck soude hebben tot sijn gelt, juweelen en secrete brieven en ander brieven van belanck, 't welck sommighe niet gheeren doen en souden, in sulcken ghevalle soude hy moeten twee sleutels hebben, te weten d'eerste die dat comtoir open doet met al d'ander plaetsen de twede die alleen dat comtoir open conde doen, sonder eenighe van d'ander vijf om die twede sleutel de dienstbode te moeten gheven.

Dese manier is oock gherievich, om als eenighe van de menichte der sleutels sijnde misleydt, verlooren of gebroocken, als dan deur des Heeren of sijn Huysvrouwen sleutel, het slot van dien te connen opendoen, sonder na de sloopmaker te wachten, die dat met een Keyser opent of andersins moet opbrecken.

Het schijnt bequaem datmen de sloten vande veinsters opent mette sleutel vande deur.

VII.5 VAN DE VERVOEGINGH DER STUCKEN, DIE IN CAMERS OF PERCKEN VEREYSCHT ZIJN, ALS STEYGERS, PORTALEN, SCHOORSTEENEN, SCHRYFKASTEN, HEYMELICKEN, FONTEYNEN, BRANDINGHPLAETSEN, REGENPYPEN, LEUVEN

– steygers [missing]

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, p. 117

Den Heer heeft syn eygen steyger om in syn quartier te gaen, want onderste der kelder tottet bovenste vanden huuse, ongesien van ymant anders des huysgesins, die een ander steyger hebben.

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<sup>62</sup> Erroneously: 'uyr'.

This is proper for a father of a household who has six different places that need locking, that he does not want anyone to have access to except himself; such as an office, money chest, a silver cupboard, a jewellery chest, a chest where he puts important letters such as contracts for houses and lands and other secret letters, further a library, or whatever it may be, that he does not want anyone to have access to.

But it may happen that his wife has a linen chest, a clothes chest, her own jewellery chest for bracelets, rings, gold chains, pearls and the like, that she does not want anyone else to have access to but herself. In such cases she can have a lock made and a key that opens all the other locks, except the aforementioned 6, and such that none of the thirty-six can open hers.

But when it happens that the master gives the key of his office to some servant, in order to get something out of it, and that the same servant would then have access to his money, jewels and secret letters and other letters of importance, which some people would not want to do, in such cases he ought to have two keys, namely the first that opens that office with all the other places the second that can only open that office without any of the other five so that he can give the second key to the servant.

This way is also convenient, because if one of the many keys is mislaid, lost or broken, then with the key of the master or his wife the lock can be opened, without having to wait for the locksmith, who must open it with a passkey or break it open in some other way.

It is convenient if one can open the locks on the windows with the door key.

VII.5 ON THE DISPOSITION OF PARTS, THAT ARE REQUIRED IN ROOMS OR COMPARTMENTS, SUCH AS STAIRCASES, PORCHES, CHIMNEYS, STUDIES, PRIVIES, DRINKING FOUNTAINS, FIREPLACES, DRAIN PIPES, LEAN-TO ROOFS

– Staircases [missing]

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, p. 117<sup>66</sup>

The master has his own staircase to get to his own quarters, from the lowest part of the cellars to the top of the house unseen by anyone else in the household, as they have another staircase.

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<sup>66</sup> The following passage comes from Hendrick Stevin's description of the model house. This does not belong to *Huysbou*, but Hendrick Stevin probably based this passage on a text that was intended to be included in *Huysbou*. See appendix E, Notes on the unfinished *Huysbou*, p. 496: H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, 2 *Hoofdstick* 13, p.117.



De steygers syn soo veroirdent, dat men tot alle camers mach comen sonder eenigh ander camers te ontvryden. Met dese twe steygers can elck deel van 't huys dienen voor een besonder huysgesin.

- portalen [missing]
- Hoemen de carpetten ande deuren en stijlen sal hechten sonder nagelen om die te connen afdoen als men wil
- schoorsteen [missing]  
Van Schoorsteen te weten om die te veroirdenen datse wel roock trecken
- brandinghplaetsen

Vande voordeelen en achterdeelen der Stoven

H. Stevin, *Materiae Politicae, Byvongh der Stedenoirdening*, pp. 74-75

*Voordeelen.*

't Isser over al warm, anders dan met een brandende vier, waer mede men in coude winters, van vooren verwarmende van achter bevriest, en die niet na ghenoech het vier en sijn lijden coude.

Ten anderen de warmte gheduert langer, want het brandende vier in een schoorsteen uyt sijnde de warmte vergaet terstont.

Ten derden ten Roockter niet in.

Ten vierden daer en is gheen stof van asschen in te verwachten.

Ten vijfden tis minder cost van brandt.

Ten sesten de stoockingh des cachelovens gebeurt buyten de stoof, sonder dat de ghene dieder in sijn daer af hindernis hebben.

Ten sevenden men cander op een nacht of min gewasschen lijnwaet in drooghen, soo bequamelick, als waer het inde heete somer, 't welck in veel huysghesinnen groote swaricheydt, heeft, voornamelick in wintersche vriesende en vochtighe daghen.

Ten achtsten de gemeene luyden koocken by 't vier vande Cachelovens.

Ten neghenden inde stoven dobbel glase veinsters, geeft groote warmte: hier af moet ick reden ondersoecken inde vorst alst vriest met twee tonnen d'een in d'ander.

The stairs are planned in such a way that one can reach all the rooms without intruding on any other rooms. With two staircases each part of the house can be used by a separate household.

- Porches [missing]
- How one can attach the carpets to the doors and door jambs without nails so that one can take them down if one wants
- Chimneys [missing]<sup>67</sup>  
[On Chimneys, namely to design them so that they draw the smoke.]
- Fireplaces

On the advantages and disadvantages of furnace rooms

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 74-75

### *Advantages*

It is warm everywhere, unlike a room with an open hearth, where in cold winters one is warm at front and freezing behind, and that those who are not close enough to the fire suffer cold.

Secondly the heat lasts longer, because when fire burning in a chimney goes out the warmth disappears at once.

Thirdly it doesn't smoke in the room

Fourthly there is no residue of ashes to be expected.

Fifthly the fuel expenses are less.

Sixthly fuelling furnaces like this occurs outside the warm room, so that no one who is in it has any unpleasantness from it.

Seventhly one can dry washed linen in a night or less, as easily, as if it were in the heat of summer, something that for many households is a great nuisance, especially in the damp and freezing days of winter.

Eighthly ordinary folk can cook on the fire of the furnaces.

Ninthly the double glazed windows in the rooms give great warmth: I must enquire the reason for this during the frost when it freezes with two barrels, one inside the other.<sup>68</sup>

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<sup>67</sup> Presumably there was a summary here of the section 'About Chimneys, namely to design them so as to draw the smoke in the best manner. 2. Of the different means used in different places' where Stevin declares his preference for the chimney with a round funnel that is bevelled at the top. See below, *Verscheyden aetekeningen. Van Roock*.

<sup>68</sup> Cf. for this passage Isaac Beekman's commentary, 'Journael', fol. 231v. lines 4-6.

*Achterdeelen.*

Het stijncjt in stoven, voornamelick daer yet in is mishaghelick rieckende, als in schoenmakers stooven het vet vet leer, Caes, ghedroochde vis, Stijnc-kende asem van menschen, Hoenderen, Gansen, Verckens en soo voort.

Ten anderen diese onghewoon sijn, wordender qualick in bycans ghelijck die Zeesieck sijn.

Men voorsiet hier teghen met int begin des winters d'eerste mael de stoof seer heet te maken: Rijcke luyden om hier in te voorsien, doen daer in dickwils welrieckende roockinghen, maer ten duert niet langhe,

- schryfkasten [missing]
- heymelicken [missing]
- fonteynen, [missing]

VII.6 VAN DE VERVOEGHING DER HOOVEN

[Missing, together with the comments on 'drainpipes' and lean-to roofs]

Isaac Beeckman, 'Journael', fol. 195v.

*Goten tusschen de huysen vant sneewater bevryden* [in the margin]

*Stevyn meyndt in syn pampieren, dat de loode goten tuschen twee huysen niet goet en syn, voornementlick om het sneewater, dat daerin valt, die stopt. Maer men gebruyckt hier te lande somptyts delen daerin geleydt eenen halven voet van de gront, daer de snee op vallende, daeronder gheen verstoppinghe maken en kan.*

VII.7 VAN DE VERVOEGINGH DER GAELDERYEN

[Missing, perhaps a section on the gardens with galleries to provide protection]

Isaac Beeckman, 'Journael', fol. 225v. lines 25-27

*De mueren van hoven kunnen beswaerlijck vast gemaect worden, daarom soude ick daer een loove tegen maken ende alsoo met houte balcken daeronder styven.*

### *Disadvantages*

There is a stench in warm rooms especially if there is something in it that smells unpleasantly, like dubbin for leather in a cobbler's warm room, cheese, dried fish, foul breath of people, fowl, geese, pigs and so on. Secondly those who are not used to them become ill almost like people who are seasick.

One can prevent this by making the stove extremely hot the first time one lights it at the beginning of winter. Rich people often prevent it with sweet smelling incenses, but their effect does not last long.<sup>69</sup>

- Studies [missing]
- Privies [missing]
- Drinking fountains [missing]

#### VII.6 ON THE DISPOSITION OF GARDENS

[missing, together with the comments on 'drainpipes' and lean-to roofs]<sup>70</sup>

Isaac Beekman, 'Journael', fol. 195v.

*Gutters between the houses to get rid of the snow* [in the margin]

*In his papers Stevin was of the opinion that the lead gutters between two houses were not good and that they get blocked, mainly from snow, that falls in them. But sometimes in this country people use parts raised half a foot from the ground, so that the snow falling on them, cannot cause any obstruction underneath.*

#### VII.7 ON THE DISPOSITION OF GALLERIES

[missing, perhaps a section on the gardens with galleries to provide protection]<sup>71</sup>

Isaac Beekman, 'Journael', fol. 225v. lines 25-27

*It is difficult to make the walls of gardens secure, therefore I would build a gallery up against them and reinforce it underneath with timber joists.*

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<sup>69</sup> Cf. for this passage Isaac Beekman's commentary, 'Journael', fol. 231v. lines 7-9.

<sup>70</sup> It would seem logical that the 'drainpipes' and 'lean-to roofs' mentioned in the title of this chapter would be discussed in the description of the gardens of houses, because, apart from the galleries, all the other facilities that are mentioned are indoor ones.

<sup>71</sup> For the contents see Hendrick Stevin's list, '*Tytels en Cortbegrypen, 9 Hoof. lidt 10*'.

## VIII Van de oirdeningh der steden

### *Cortbegryp*

H. Stevin, *Eenighe Stucken der Crychconst*, K.B. 128-A-9-II, fol. 2r.

### Vande Oirdening der Steden

Angesien uijt vergaring van veel huijsen, Steden commen die wel veroirdent sijnde tot groote bequamheijt en gerief der huijsen strecken, soo is de oirdening der steden stof totten huijsbou' gehoorende, daerom sal icker af seggen als volcht.

### VIII.I VANDE MIDDELEN DAERMEN GROOTE MACHTIGE STEDEN DOOR MAKEN CAN

H. Stevin, *Eenighe Stucken der Chrychconst*, K.B. 128-A-9-II, fol. 3r.-3v.

Ick segh dat een seer machtich Vorst, voornemen hebbende van de beste Stadt te maecken diet hem mogelick is, brengt daerin het Vorstelick hoff met alle de opperste Raetcamers of vergaringen<sup>63</sup> van sijn regering, gelijk van Staet, Recht, Reeckening, Zeesaken,<sup>64</sup> Chrijch, Munte, kercken etz; welcke alsoo bij den anderen sijnde, strecken benevens de grootmaecking van Steden, noch tot meerder gerieff inde regering, om de redenen vandien<sup>65</sup> breeder verhaelt int [...] hoofdstick. Noch soude ick daer in brengen het Oppersteschool;<sup>66</sup> Oock hantwercken, voornamelick weverijen van dingen die verre en na seer gesleten werden; Sgelijcx Visscherije en Scheepbou; bovendien (dat de Steden aldermeest verbeteret) de Coomschap met verscheen uijtlandtsche Cooplien, die

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<sup>63</sup> In the margin: 'Collegien'.

<sup>64</sup> In the margin: 'Admiraliteyt'.

<sup>65</sup> In the printed text: 'die daer af'.

<sup>66</sup> In the margin: 'Academia'.

## VIII On the layout of towns

### *Summary*

H. Stevin, *Eenighe Stucken der Crychconst*, K.B. 128-A-9-II, fol. 2r.

### On the Layout of Towns

Seeing that, by grouping many houses together, towns come about that, being well ordered, add to the greater convenience and comfort of the houses, the designing of towns, a matter therefore pertaining to architecture, I shall speak of it as follows.<sup>72</sup>

#### VIII.I ON THE MEANS WITH WHICH GREAT AND POWERFUL CITIES CAN BE CREATED

H. Stevin, *Eenighe Stucken der Chrychconst*, K.B. 128-A-9-II, fol. 3r.-3v.

I say that a very powerful prince, intending to make the best city that is possible for him, should include in it the royal court with all the supreme council chambers or assemblies, namely of the state, justice, exchequer, the navy, army, the mint, churches etc; which being brought all together are conducive to the greatness of cities, and also to the greater benefit of the government, for the reasons that are stated in more detail in the [...] chapter.<sup>73</sup> Further I should include the university; Also crafts, especially weaving things that have become extremely worn; likewise fisheries and shipbuilding; moreover (something that improves cities most of all) commerce with various foreign merchants, who

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<sup>72</sup> In Hendrick Stevin's manuscript this text is preceded by the heading 'Cort Begrijp', or summary and is followed by a list of contents. Although it is possible that Simon Stevin had also wanted to include a list of contents here, this is by no means certain. Since we cannot be sure how it would have looked had been one, it has been omitted. The list of contents can however be consulted in the appendices.

<sup>73</sup> In the printed version Hendrick Stevin adds that: 'it will be told in the list of the first chapter of the ordering of the councils what the following third section is'. In short the material that his father had originally wanted to present in another chapter of *Huysbou*, is included by Hendrick Stevin in another section of *Materiae Politicae*.

daer wonen en hun handel drijven. T is wel waer dat alle dese voorschreven<sup>67</sup> dingen in een Stadt te brengen, tot sommige plaetsen niet geschien en mach, om dat verscheijden Steden met ijēt besonderlijcx Gheeiigenwetticht<sup>68</sup> sijn, en hemlien niet en mach ontrocken worden, doch cant in eenige landen anders vallen, en mach het wit blijven, vande saecke soo na te commen als doenelick is.<sup>69</sup>

Angaende sommige van gevoelen sijn, de grootste Steden niet de bequamste te wesen, om daer in een vreetsaem wellustich leven te leijden,<sup>70</sup> maer wel de middelbare, onder welcke Aristoteles<sup>71</sup> meent dat [...] <sup>72</sup>burgers een bequame menichte is ; men soude als men de omstandicheden overleijde, anders daer af mogen oirdeelen, insiende Eerstelick dat in sulcken Stadt overvloet is van alle dingen der werelts, soo wel dieder de natuer des lants niet voort en brengt, als diederwassen, en dickwils seer goeden coop: Men hoort in sulcke Steden watter over al inde werelt ommegeat, ja de vreemdicheden des Werelts vergaren daer. Die ten hove off in eenige der opperste Raetcamers te doen hebben, enbehouden niet verre te reijsen. Die hun inde bouckstaven<sup>73</sup> willen oeffenen, hebben het hooch School bijder hant, dat oock bequaem is voor Burgers die hun kinderen daer in willen optrecken, sonder die tot groote cost buijtens slants te moeten senden, oock oorsaeck wesende van veel geleerden diemen in sulcken Stadt crijcht: Voort die ijēt constelick wil gemaect hebben, of selff leeren maecken of zjn kinderen doen leeren, heeft menichte van constenaers al gereet, want na het spreekwoort daer het aes is vergaren de vogelen. – Angaende geacht wort dat meuterien inde seer groote Steden, om de groote menichte des Volcx dickwilsder vallen dan inde cleene, dat en schijnt niet vast te gaen: Het can wel gebeuren datse vande<sup>74</sup> cleene niet soo vermaert en sijn, noch soo eijgentlick beschreven en worden, maer dickwils sijnse voorde inwoonders ghedueriger en veel beswaerlicker. Tot voorbeelt van desen [...] In somme<sup>75</sup> [...] t' mach den eenen hier den anderen daer beter gelucken, maer int gemeen geseijt, het angenaemste beste leven schijnt inde grootste, meest bewoonde rijkste ende machtichste Steden, daer ghedeurige vermeerdering

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<sup>67</sup> In the printed text: 'verscheyden'.

<sup>68</sup> In the margin: 'Geprivilegeert'.

<sup>69</sup> In the printed text: 'van de sake'.

<sup>70</sup> In the printed text: 'lyden'.

<sup>71</sup> In the margin: 'Bij Aristote: noch te seggen vande grootste steden als Ninive, Babilon, Alcaire Chyna; etz.'

<sup>72</sup> In the printed text Hendrick Stevin added the words 'seker getal', a certain number.

<sup>73</sup> In the margin: 'Letteren'.

<sup>74</sup> In the printed text: 'van'.

<sup>75</sup> Deleted: 'ge'.

live there and practice their trade. It is of course true that to include all these above-mentioned things in one city, is not possible in some places, because various cities are endowed with certain rights, and this may not be taken from them, but it can be that in some countries it may occur otherwise, and where it is absent, to approximate it as closely as possible.

Regarding some people who are of the opinion, that the greatest cities are not the most convenient to live a peaceful and pleasurable life in, but rather the medium-sized, among them Aristotle [Re Aristotle: remember to discuss the great cities such as Nineveh, Babylon, Cairo, China etc. (in the margin)]<sup>74</sup> is of the opinion that [...] citizens is a goodly number; if one took account of the circumstances, one might conclude otherwise, seeing that firstly in such cities there is an abundance of all the things in the world, both that which the nature of the country does not produce, as that which does grow there, and often very cheap: in such cities one hears what happens everywhere in the world, yes the foreign things of the world can be found there. Those who have dealings in the court or in one of the supreme council chambers do not have to travel far. Those who want to exercise themselves in letters, have the university close at hand, that is also convenient for citizens who want to bring up their children there, without having to send them out of the country at great expense, this being also the cause of the many scholars that one finds in such cities: further he who wants something artfully made, or wants to learn himself to make it or that his children learn it has many artists ready, since according to the proverb where there is carrion the birds gather. Concerning the fact that it is thought that riots occur more often in very big cities than in the small ones, because of the great mass of people, it appears that this is not certain: it may well be that they are not so notorious in the small towns, nor are they really described as such, but they are often more lasting and much more burdensome for the inhabitants. As an example of this [...] In conclusion it may be that some are more fortunate here and others there, but speaking generally, the most pleasant form of the good life seems to be in the largest and most populated rich and powerful cities, since constant expansion occurs there, and is still to be

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<sup>74</sup> This section of chapter VIII is incomplete. See appendix E, Notes on the unfinished *Huyssbou*, p. 492: H. Stevin, *Materiae Politicae*, 1 *Onderscheyt van de Oirdeningh der steden*, Hoofdstick 1, p. 9.



afgeschiet, en noch verwacht wort. En met insicht van sulcke gedeurige oirdenticke vermeerdering sal ick deser Steden oirdeningh beschrijven. Daer volcht nu te seggen, [...] <sup>76</sup>

VIII.2<sup>77</sup> VANDE VERKIESING DER PLAETSEN<sup>78</sup> DAERMEN DE STEDEN WIL LEGGEN  
H. Stevin, *Eenighe Stucken der Chrychconst*, K.B. 128-A-9-II, fols. 3v.-4v.

't welck sijn meeste gebruijck schijnt te hebben in nieuw gevonden landen, daer ghemeenten hun willen neersetten, alwaer tgeschil sijnde wat plaets men daer toe nemen sal, soo sietmen int gemeen geseijt na een vruchtbare gront, gelegen bijde mont van een groote bevaerlijcke rivier, commende uijt verre landen, Want sulcke plaetsen dobbel vaert connen krijgen, d'eene in Zee dander te landewaert in. Voort soo het gewas en hantwercken der Ingesetenen van sulcke wijtstreckende landen over de werelt soude verspreijt worden, het moet al deur dien mont. Sgelijcks alle overzeesche goeden die sulcke landen behouwen, moeten sij al deur desen mont krijgen, veroirsaeckende grooten handel en verbontenis van d'een met d'ander, oock groot incommen van tollen en schattingen die de deurvarende goeden betalen moeten. Van sulcke gelegentheijt is Egipten anden mont vande Nilus, daer eertijts een selsaem rijckdom geweest, ende nu noch soude cunnen sijn, ten ware hun heer den grooten Turck dat selfs (soomen seyt) verhindert, van sulcke gelegentheijt is hollant anden mont vanden Rhijn en Mase, wesende twee groote bevaerlicke rivieren, commende uijt verre wel bewoonde landen, twelck tot voorbeelt can verstrecken vantgeen vooren geseijt is; want de rijckdom en tvermogen uijt sulcke gelegentheijt veroirsaeckt, seer seltsaem is, ghemerckt soodanigen dobbelvaart als hollant heeft nu op den Eertbodem niet bevonden en wort, noch oirdelende na nateurliche redenen in menschens leven niet commen en can, want hoewel de Donau in Europa, den Nilus in Affrica, Ganges in Asia, Roo Damasones in America & meer ander veel grooter sijn, dan den Rhijn, soo souder te veel tijts behouwen, om de middelen op te rechten dieder toe noodich sijn: als onder anderen hoe soudet ergens meugelick wesen op corten tijt te krijgen over de hondert duijsent cloucke ingesetenen, seevarende mannen, gelijcker in hollant op een cleene plaets bij den anderen bevonden worden; hoe souder ergens op cortentijt een sulcken machtigen gesetten handel connen gemaect worden, tusschen het landt ande Riviermont ende de landen ande rivieren gelegen, gelyckter is tusschen Hollant ende de wijtstreckende landen gelegen anden Rhijn en Mase met ander bevaerlicke rivieren daerin commende; hoe souder in corten tijt

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<sup>76</sup> In the printed text, 'int' follows here.

<sup>77</sup> In the printed text 'Hooftstic' is inserted here.

<sup>78</sup> In the printed text: 'plaets'.

expected. And with this enduring orderly increase in mind I will describe the layout of these cities.

There follows now to say,

VIII.2 ON THE SELECTION OF SITES IF ONE WANTS TO LAYOUT TOWNS

H. Stevin, *Eenighe Stucken der Chrychconst*, K.B. 128-A-9-II, fols. 3v.-4v.

The most common usage in newly discovered lands, where communities wish to settle, there is a dispute about which place to choose, so generally speaking one looks for a fertile piece of land, situated at the mouth of a great navigable river, coming from distant countries, because such places can have two-way traffic, one from the sea the other inland. Further for the crops and crafts of the inhabitants of such vast countries to be distributed around the world, it all has to go through this river mouth. Likewise all overseas goods that such lands need, they must obtain them all through this river mouth, resulting in great trade and relations one with the other, also great incomes from tolls and duties that the goods passing through have to pay. Such advantages favour Egypt at the mouth of the Nile that was once exceptionally rich, and still could be, were it not that the great Turk (so it is said) prevents it, in such a situation is Holland at the mouths of the Rhine and Maas, being two great navigable rivers, coming from distant populated countries, which can serve as an example of what was said above; because the wealth and power resulting from such opportunity, is very rare, seeing that such a double trade such as Holland has cannot now be found in the world, nor judging from natural arguments can it come in our lifetime, because although the Danube in Europe, the Nile in Africa, Ganges in Asia, the Red Amazon in America and still others are much longer than the Rhine, it would take too much time, to set up the means that are necessary there: as for instance how would it be possible in a short time to obtain more than a hundred thousand valiant inhabitants, seafaring men, like those in Holland in a small place elsewhere;<sup>75</sup> how could one make somewhere else in a short time such a firmly established commerce, between the countryside and the river mouth and the countries situated on the river, such as there is between Holland and the extensive countries situated on the Rhine and the Maas with other navigable rivers flowing into them; how could one

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<sup>75</sup> Cf. for this passage Isaac Beeckman's commentary, 'Journael', fol. 232v lines 21-22.

sulcken visscherije op te rechten sijn alser in hollant is, alwaer sonder d'ander Visscherijen over de [...] duisent buijsen alleen op den harinck varen, die al de werelt deur gesleten wort. Sulcx dattet<sup>79</sup> schijnt vast te gaen tgeene geseijt is, teweten datter een lange tijt soude behouven omsulcken dobbelvaert alser in hollant is, metter daet elders te krijgen, waer bij men verstaen mach het voordeel datter uijt sulcke gelegentheijt van landt te halen is, want Seehavens als van Marseille, Genua, Napels en diergelijcke sonder bevaerlicke rivieren, tgeene daer comt en can te landewaert in niet verbreyt worden, of soo weijnich dattet niet te bedien enheeft, maer moeten de goeden weerom in Zee, tot plaetsen daer ijgelick sijn goeden brengen mach.

### VIII.3 VAN DE FORM DER STEDEN

H. Stevin, *Eenighe Stucken der Chrychconst*, K.B. 128-A-9-II, fol. 4v-9v.

Ghelijck de leering in krijchandele van het logieren, naerderen, en veltslach, daer elders breeder afgeseijt is, bequamelick aengevangen wort met voorbeelden op platte velden, omdat de form vandien eenvoudich sijnde, de leering, daer op gegront, dienen can voor gemeen regel, uijt welcke getrocken wort tgeene men tot sijn meeste voordeel doen mach opde landen met bergen, dalen, bosschen, rivieren en marassen diens formen van oneijndelicke verscheijdenheden sijn, alsoo houde ick oock, om deselve redenen, de leering van het oirdenen der Steden bequamelick an te vangen met voorbeelden op platte velden, en dienvolgens seg ick aldus. De viersijdege rechthouck op een plat even landt is mijns bedunckens der Steden bequamste form, om daer in te krijgen geschickte rechthouckige blocken, erven, huijsen, hoven, merckten, en plaetsen, welke in ander formen soo niet vallen en connen; want vijfhouckige en veelhouckige steden, al sijnsse int<sup>80</sup> ront beschrijvelick, met een oirdentlick merckt int midden, en straten van daer totte bolwercken, alles met lijcksijddiger gestalt, soo vallen nochtans veel huijsen blocken en erven scheefhouckich, en opt een eijnde breeder als opt ander soomen sien mach in Palma [...] <sup>81</sup> met meer ander Steden en Sterckten, alsoo nieu gebouwt. Angaende hier opgeseijt wort dat rechthoucken der Steden qua Streckte veroirsaken, om dat de bolwercken daer commende scherp vallen; Ick segh daer tegen sulcx niet nodich te wesen; Maer recht te mogen sijn, wanneermen de Strijckweeren <sup>82</sup> der nevenstaende bolwercken noch eens soo lang maeckt als de Strijckweeren der rechthouckige bolwercken op de rechthoucken der Stadt commende. Volgens van sulck

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<sup>79</sup> In the manuscript 'tet' deleted, but included in the printed text.

<sup>80</sup> In the margin: 'circolo circumscripibilis'.

<sup>81</sup> In the printed text Hendrick Stevin included 'Coevooren' (Coevorden).

<sup>82</sup> The printed version contains a marginal note with the word 'flanken'.

establish somewhere else in a short time such fisheries as there are in Holland, where even excluding the other fisheries over the [...] thousand busses that sail only for herrings, that are sold all over the world. So that there seems to be no doubt about what has been said, namely that it would take a long time really to actually achieve somewhere else such a twofold trade as there is in Holland, by which one should think of the profit that can be had by a country from such an opportunity, because Harbours such as those of Marseilles, Genoa, Naples and the like without navigable rivers, that which arrives there cannot be distributed inland or so little that it is of no use, but the goods must go once again by sea, to places where everyone may bring his goods.<sup>76</sup>

### VIII.3 ON THE FORM OF TOWNS

H. Stevin, *Eenighe Stucken der Chrychconst*, K.B. 128-A-9-II, fol. 4v-9v.

Just as the study in warfare of quartering, advancing and battles, as is described in detail elsewhere is conveniently shown with examples on level terrain, because their form is simple, the study based on it, can serve as a common rule, from which it can be concluded how one can act to greatest advantage in countries with mountains, valleys, forests, rivers and marshes whose shapes are of endless variety, for the same reason I also think that the study of the planning of towns may be conveniently undertaken with examples on level terrain, as I will say in what follows. The four-sided rectangle on a flat level piece of ground is in my opinion the most convenient shape for towns, in order that they may contain suitable rectangular blocks, such as plots, houses, gardens, markets and squares, which do not fit in another shape; because pentagonal and polygonal towns, although they can be drawn in a circle, with a well-ordered market in the centre and streets from there to the bastions, all with a like-sided form, yet many houses, blocks and plots become lopsided and broader at one end than at the other, as can be seen in Palma [...] with many other towns and fortresses, including those newly built. Supposing it is said that rectangles do not give towns strength, because the bastions there are at right angles; on the contrary I say that this is not necessary; but that they should be straight, when one makes the flanks of the adjacent bastions twice as long as the flanks of the rectangular bastions at the corners of the town. In accord with this

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<sup>76</sup> A note by Hendrick Stevin here states that he has inserted the chapter from *Huysbou* at this point to show what his father discusses in the following section. He also points out here that *Stedenoirdening* also derived from *Huysbou*. Curiously, he states that the discussion of 'lyckseydichheit' comes from the second chapter. This does not tally with his list of contents in *Materiae Politicae*, 'Tytels en cortbegrypen' and is therefore probably a mistake. See appendix E, Notes on the unfinished *Huysbou*, p. 492: H. Stevin, *Materiae Politicae*, 1 *Onderscheyt van de Oirdeningh der steden*, Hoofdstic 1, p. 9.

besluit, ick stel dese form eens Stadts van een viersijdich rechthouck, hebbende op elcken houck een rechthouckich bolwerck, en haer nevenstaende bolwerckens strijckweeren noch eens soo langh. Als bij voorbeelt het strijckweeer A B, noch eens soo lanck als het strijckweeer CD des bolwerckx op den houck commende; Want daer me wortde voorsijde DE gestreecken van FA helft van AB, soo lanck sijnde als het heele Strijckweeer CD daer van ick in de Stercktebou eigentlicker seggen sal. In dese Stadt neem ick de straten over al breed 60 voeten, mits welverstaende, datter over elcke zijde voor de huijsen comme een galerije<sup>83</sup> van 10 voeten breed, om menschen in te gaen sonder wagens of paerden, en commende dese straten eijntlijck al uijt op bolwercken en middels van Gordinen van welck gerief gesijt is int [...] hoofdstick,<sup>84</sup> sulcx datter tusschen de twee galerijen open straet blijft van 40 voeten, voor paerden en wagens. Totte blocken der huijsen sijn genomen viercanten elcke sijde van 360 voeten, twelck ick in groote steden voor bequame langde houde om twee erven van huijsen ruggeling teghen malcander te commen daer af de redenen eijgentlicher verclaert sijn int [...] hoofdstick,<sup>85</sup> Voort commen inde Stadt drie havens' elck breed 180 voeten,—

De plaetsen met getalen geteijckent sijn als volcht,<sup>86</sup> [ill. 43]

1 De groote marckt.	17 Vischuijs
2 De Coornmarckt.	18 hoochschool
3 De houtmarckt.	19 het Armenhuijs
4 De beurse.	20, 21, 22, 23, Uuijtheemsche Cooplien
5 De Steenmarckt.	huijsen,
6 De beestenmarckt.	24. 25 Caden
7, 8, 9, 10, 11. vijf kercken daer af 7 de groote is.	26, een der blocken met manier van verdeeling gelijcker valt inde groote menichte der Burgerlicke huijsen <sup>87</sup>
12 Vorstelick huijs of hoff.	
13 het stadthuijs.	
14 Vangenis.	
15 Tuchthuijs.	
16 Vleeschuijs.	

<sup>83</sup> In the printed text: 'Loove'.

<sup>84</sup> In the printed text: 'gesijt is int [...] hoofdstick' is replaced by 'elders geseyt is'.

<sup>85</sup> In the printed text: 'der Huysbou' is inserted after 'hoofdstick'.

<sup>86</sup> In the printed version 'De percken die eenige ghemeene plaetsen beduyden, sijn met woorden angewesen' (the compartments representing specific functions are indicated by name on the map). The passage follows with 'L, M, N, O, sijn uytheemsche Cooplien huysen. Onder P wort angewesen een der blocken met manier van verdeeling dieder valt inde groote menichte der Burgerlicke huysen. Welcke verdeeling oock gedaen can worden na de manier die int volgende 5 Hoofdstick verclaert sal worden'.

<sup>87</sup> The printed version contains an additional sentence: 'welcke verdeeling oock gedaen can worden na de manier die int volghende 5 Hoofdstick verclaert sal worden'.

decision, I propose this form of a four-sided rectangle for a town, with a rectangular bastion at every corner, and its flanks next to the bastions, just as long. As for instance the flank A, B is twice as long as the flank C, D of the bastion at the corner; because in this way the front side D, E is covered by F, A half of A, B being as long as the whole flank C, D, as I will discuss more specifically in *Stercktebou*.<sup>77</sup> In this town I take the streets to be 60 feet wide everywhere, on condition, it should be understood, that a gallery ten feet wide comes on both sides in front of the houses, so that people can walk without carts or horses, and with these streets all actually ending at the bastions and in the middle of the curtains the convenience of which is discussed in [...] chapter, so that between the two galleries there remains an open street of 40 feet, for horses and carts. For the blocks of houses squares are used of 360 feet each side,<sup>78</sup> which I regard as a convenient length in great cities for two plots of houses to be planned back to back the reasons for which are stated more specifically in [...] chapter, further three harbours are planned in the town each 180 feet wide, the sites with numbers are as follows [ill. 43]:

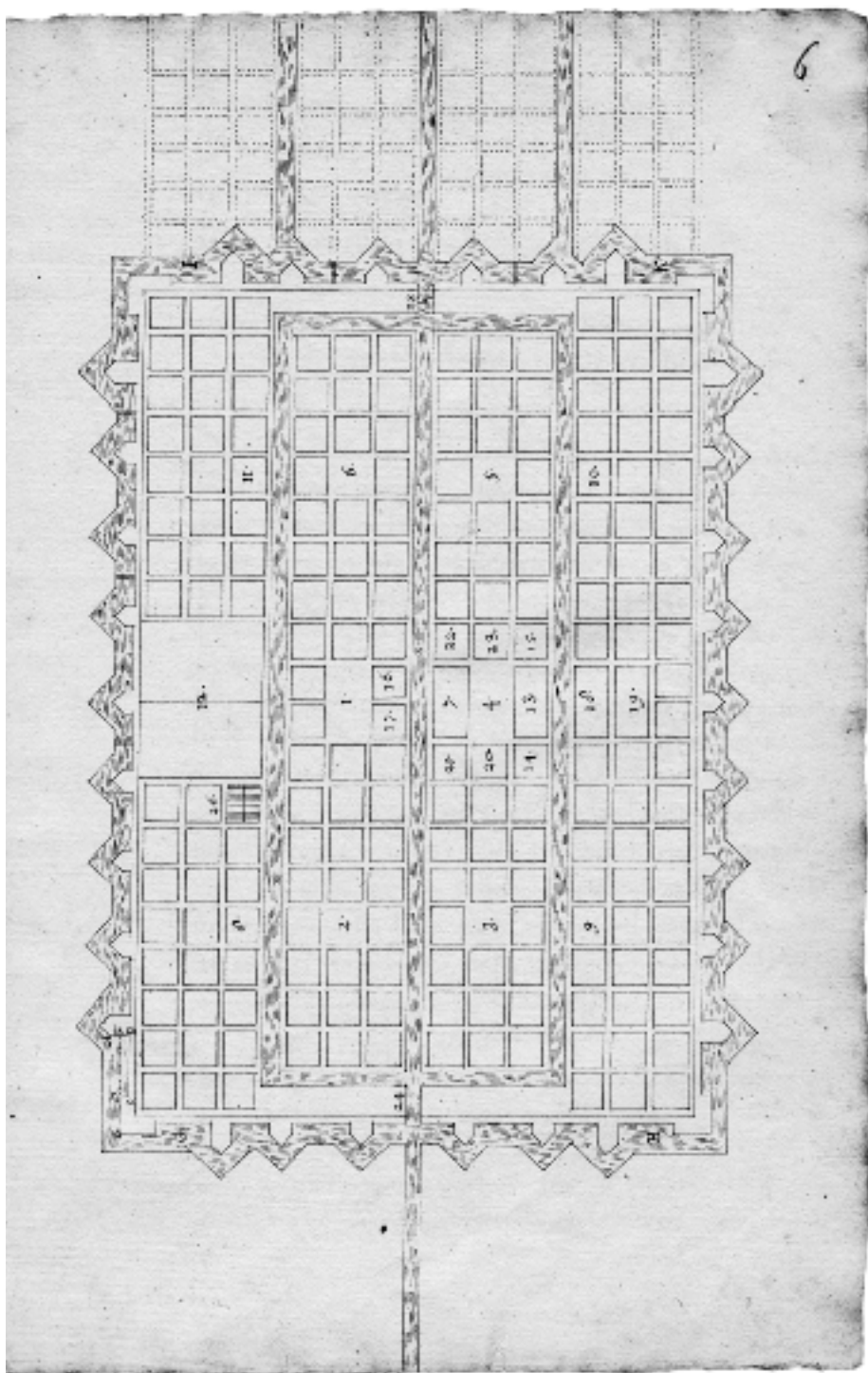
- |                                   |                                      |
|-----------------------------------|--------------------------------------|
| 1 Great market.                   | 17 Fish hall                         |
| 2 Corn market.                    | 18 University                        |
| 3 Timber market.                  | 19 Poorhouse                         |
| 4 Exchange.                       | 20, 21, 22, 23, Foreign merchants'   |
| 5 Stone market.                   | houses                               |
| 6 Livestock market.               | 24. 25 Quays                         |
| 7, 8, 9, 10, 11. Five churches of | 26, Blocks with manner of layout     |
| which 7 is the main one.          | such as is used for the great number |
| 12 Princely house or court.       | of private houses                    |
| 13 Town hall.                     |                                      |
| 14 Prison.                        |                                      |
| 15 House of correction.           |                                      |
| 16 Meat hall                      |                                      |

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<sup>77</sup> *Stertebou* here does not refer to the *Sterckenbouwing* of 1594 or the *Nieuwe maniere van Stertebou door Spilsluising* of 1617 because this subject is not discussed there. The same goes for the French translation of the manuscript, Paris Bibl.Nat., Mr.fr. 24264. Stevin is probably referring to the publication of the *Crychconst.*

<sup>78</sup> Cf. for this passage Isaac Beeckman's commentary, 'Journael', fol. 232v. lines 23-25.

[ill. 43 on next page]



ill. 43

[map of the city with the numbers referring to the functions on the previous and following folios]



Om nu wat breder verclaring te doen vande voorschreven verdeeling, soo is de groote marckt geteijckent i ontrent het middel vande Stadt na t'behooren, inde selve ist gerievich vercocht te worden alle versche eetelicke waren, die de Ingesetenen dagelicx behouven, als vleesch, visch, ghevogelte, suijvel, groente, en fruijt, om niet te moeten gaen tot verscheiden plaetsen verre van malcander gelegen, daerom is oock hier<sup>88</sup> ande selve marckt veroirdent het vleeshuijs geteijckent 16 het Vischuijs of vischmerckt 17 staende bequamelick ande wattercant. Angaende gevoghelte suijvel groente en cruijt<sup>89</sup> wesende dingen die de lantlien dagelicx versch brengen, de selve staen gemeenelick opt marck velt, elck op sijn oirt en behouven in groote Steden groote plaets, want bij tgevoegelte dienen na tgebruijck van veel steden te staen eijeren, hasen, coninen, braetverckens, worsten, beulingen, pensen, Onder suijvel verstaet men, melck, room, versche caes en botter, onder groente dient warmoes, salaet, cancommers,<sup>90</sup> colen, peen, bloemen, wel rieckende kruiden, mette zaden vandien,–

D'ander marckten geteijckent 2,3,5,6, (te weten Coornmarckt, houtmarckt, Steenmarckt en beestemarckt)liggen elck int middel tusschen twee rivieren bequam tot aenvoering der goeden. De burse 4 mette uijttheemsche Cooplien<sup>91</sup> huijsen geteijckent 20, 21, 22, 23 sijn ontrent het middel der Stadt. De groote kercke 7 is oock ontrent het middel der stad, en dander vier geteijckent 8.9.10.11. staen soo verdeelt, datter geen Burgerije verre van een kercke en is,

Angaende het Vorstelick huijs 12, van sijn behoorlicke plaets is bij eenige verscheen gevoelen, sommige willen dattet sijn een besonder slodt of sterckte, met wallen en grachten tendeele buijten de stad uijtsteekende, om tegen alle onverhoede swaricheden den Vorst daer in verseeckerder te sijn, de Stadt in sijn dwanck te houden, en de qua na sijn wille te straffen. Ander achten sulcx wel te dienen voor een wreetaerdich Vorst, of anders voor een diens regiering niet vast genouch staende sijn ondersaten vreest, maer sulcx niet wesende dat hij sijn hoff behoort te houden int middel vande Stadt, om buijten alle quaet vermoen wel bemint te sijn, ende de stad seer te mogen verbeteren, want Cooplien voornamelick de uijtlantsche daer groote rijckdom af comt en wagen hun welvaren niet geeven in steden met sloten<sup>92</sup> die vant Crijchsvolck bewaert worden.

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<sup>88</sup> The word 'oock' is separated from 'hier' in the ms.; the printed text reads 'hier oock'.

<sup>89</sup> The printed version omits the words 'en cruijt'.

<sup>90</sup> In the printed version: 'concommers'.

<sup>91</sup> In the margin: 'natiehuijsen'.

<sup>92</sup> In the printed text: '-en' instead of 'sloten'.

To make now a somewhat more detailed explanation of the layout just described, the great market is drawn in about the middle of the town as is proper, in the same it is convenient for all fresh edible goods to be sold that the inhabitants need daily, such as meat, fish, fowl, dairy goods, vegetables, and fruit, so as not to have to go to different places at a distance from each other, therefore in the same market the meat hall is also marked here 16 the fish hall or fish market 17 conveniently situated on the water front. Concerning fowl dairy goods vegetables and herbs being things that the countrymen bring in fresh daily, the same are generally found on the market square, each in its own place and needing a large place in great cities, since under fowl according to the use of many towns is understood eggs, hares, rabbits, roasting pigs, sausages, chitterlings, tripe, under dairy goods one understands, milk, cream, fresh cheese and butter,<sup>79</sup> under vegetables leaf greens, salad greens, cucumbers, cabbages, carrots, flowers, sweet smelling herbs, with their seeds.

The other markets drawn 2, 3, 5, 6 (namely corn market, timber market, stone market and livestock market) are each situated in the centre between two rivers convenient for conveying the goods. The exchange 4 with the houses for foreign merchants drawn in 20, 21, 22, 23 are close to the centre of the town. The great church 7 is also close to the centre of the town, and the other four drawn in as 8, 9, 10, 11 are so laid out, that none of the citizens is a long way from a church.

Concerning the princely house 12, opinions vary about what its proper place is, some people would like it to be a separate castle or stronghold, with ramparts and moats, partly projecting outside the town, in order that the prince will be more secure against all unexpected calamities, to keep the town under his control, and to punish evildoers as he wishes. Others consider that such may well serve for a tyrannical prince, or otherwise for one whose rule is not firm enough and who thus fears his subjects, but such not being the case that he ought to keep his court in the centre of the town, to be loved without any evil suspicions, and to be able to improve the town greatly, because merchants especially the foreign ones from whom great wealth comes do not risk entrusting their wealth in towns with castles that are defended by soldiers. Between these two a middle way has my approval, namely no projecting castle with ramparts and moats against the town, nor also in the centre of the town, so that the prince cannot go outside without constantly going through the town, and being seen by the commonality, but on the walls of the town with its own

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<sup>79</sup> Cf. for this passage Isaac Beeckman's commentary, 'Journael', fol. 232v line 26.

Tusschen dese twee heeft mij tot voorbeelt eens middelwech bevallen, te weten geen uijsteeckende Slodt met wallen en grachten tegen de stadt, noch oock soo teenemael int middel der Stadt, dat de Vorst niet daer buijten en soude connen trecken, zonder telckens deur de Stadt te gaen, ende vande gemeente ghesien te wesen, maer ande stadswallen met zijn eijgen uijtganck of poorte tusschen twee bolwercken int middel der gordine.

hier vooren is geseijt dat, willende een Vorst de beste Stadt maecken, diet hem mogelijk is, daer in brengt het Vorstelick hoff met alle de opperste raetcamers van sijn regering: Wijder seg ick nu dat mij die niet alleen bevallen en souden in een Stadt, maer soudese oock al bij malcander begeeven in een gesticht om redenen naerder verclaert int [...] hoofstick,<sup>93</sup>

Volgens welcke meijninge de selve verstaen worden altemael in dit Vorstelick hoff begreepen te wesen, die daerom op geen ander plaetsen veroirdent en zijn.,—

Het Stadthuijs 13 is oock ontrent het middel der Stadt met Vangenis 14 en tuchthuijs 15 daer nevens.

Bij het hoochscool 18 verstaen ick te gehooren de Stadtschool, oock de schermeschool en Schotterdoelen daermen de Crijchandel leert, als schieten met hantroers, bussen, — musquetten en grofgeschut, maer sonder hantbogen oft Cruijsbogen die nu inden Crijch geen gebruijck en hebben;

Voort de Ruijterconst vervougende alsoo de leeringen bij malcander sulcx dat dese altsamen een groot gesticht souden maecken.,

In het Armhuijs 19 soude ick bij een vergaren, al tgeene in ander steden tot verscheijden plaetsen veroirdent is: als Outmannenhuijs, Sieckhuijs, Lasarus-huijs, blindelienhuijs, Schamelweeshuijs, Gasthuijs, Vondelinghuijs, Outvrouwenhuijs, Pesthuijs, Pockhuijs, Dulhuijs met dieder meer sijn: En over al de regierders van welcke een gemeen opsiender wesende, soo soude dit oock een geschickt groot gesticht connen vallen.,

Int viercant onder 26 wort angewesen de manier der verdeeling eens blocx in gemeene burgerlicke erven,<sup>94</sup> om die uijt te delen of vercopen elck na sijn behoefte.

D'ander groote menichte van ongetalde<sup>95</sup> viercante percken sijn blocken tot huijsen der gemeente en andere nodige gestichten.,Over de havens soude ick

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<sup>93</sup> The printed version reads 'verclaert by 't laest vant 1 Hoofsticck des volgende derde Onder-scheyts'.

<sup>94</sup> In the printed text: 'burgerlicke huysen of erven'.

<sup>95</sup> In the printed text: 'ongetalde' is omitted.

exit or gate between two bastions in the centre of the curtain.

The above is said because, if a prince wants to make the best town, that is possible, he will include in it the royal court with all the supreme council chambers of his government: furthermore I say now that it does not only please me that they should be in a single town but they should be also be included in a single building for the reasons explained in more detail in [...] chapter.

According to this idea the same is said that they should all be included in this royal court that should therefore not be planned in any other place.

The town hall 13 is also close to the centre of the town with the prison 14 and the house of correction 15 next to it.

By the university 18 I understand the town school, and also the fencing school and the archery range as belonging to it so that one may learn the art of warfare, such as shooting with hand guns, arquebuses, muskets and heavy artillery, but excluding long bows or crossbows that do not now have any use in war.

Further the art of riding thus disposing all the pupils together so that all together they form a single great building.

In the poorhouse 19 I would bring together things which in other towns are situated in separate places: such as the old men's home, hospital, leper's home, blind people's home, needy orphans home, hospice, orphanage, old women's home, plague hospital, pox hospital, mad house and so on: and since everywhere the governors of them being general supervisors, so this too could be in an appropriate large building.

The square under 26 shows how a block can be divided into common private plots, to be shared out or sold each according to his need.

The other large numbers of unnumbered square compartments are blocks for houses of the commonality and other necessary buildings. Over the harbours I would like to have many bridges, and also a bridge on every street that leads to them.

The gates will come between two bastions in the centre of the curtains, of such a number that there is one gate between every two bastions.

veel bruggen begeeren, als an elcke straet daer op uijtcomende een brugge.<sup>96</sup> De poorten sullen commen tusschen twee bolwercken int middel der gordinen, in menichte soo veel datter van twee tot twee bolwercken komme van poorten.,

De loosing vant regenwater dient int begin oock bedocht en de Straten totte afwatering bequamelick veroirdent.

Tot sommige plaetsen legt men een goote int middel der straet. Elders twee gooten op elcke sijde langs de huijsen een, wesende de Straet int middel hoochst: [ill. 44] Noch isser een derde beste wijze te weten een overwelfde<sup>97</sup> waterloop int middel onder de straet drie ofte vier voeten hooch, en oock soo breet met overwelfde sijdling gootkens commende van voor de huijsen tot in de waterloop in welcke het water comt deur ijsen tralien of platen met gaten, soo cleen datter geen groote steenen, hout ofte ander dingen in en commen die stopping veroirsaken ; met dese overwelfde waterlopen en heeft men niet sulcken verstopping, vergaring van slijck op de Straten, noch stanckx gelijk met d'ander. In Steden die van binnen geen rivieren noch grachten en hebben doet men het regenwater loopen deur de poorten in de Stadsvesten.

In dese form sijn overal lange rechte straten geteijckent: En hoewel an sommige de cromme gevallen, achtende vermaeckelick te sijn, dat men al voortgaende telckens verandering van gestichten siet, soo mocht men daer op antwoorden ten eersten dat veel schoone gestichten t'seffens te sien angenamer int gesicht gelaet dan weijnich. Ten anderen dat cromme Straten ongeschickte form van huijsen en erven veroirsaecken. Laet tot verclaring vandien A B in dese eerste form een cromme Straet wesen, waer in de erven onderscheijden sijn met rechte ewewijdige linien, als CD, EFGH, Twelck soo sijnde, het voorhuijs an straet commende heeft deen houck DCE plomp en d'ander CEF scherp, van ongeschickte form, onbequam om daer in te stellen viercante tafels, bedtsteen, cassen en diergelijcke., Maer bij aldienmen de linien niet en treckt evenwijdich, dan soo dat de voorhuijsen ande Straet sijde twee evenhoucken krijgen, gelijk in dese tweede form,<sup>98</sup> soo vallen [ill. 45] sommige erven en camers achter wijder ettelicke achter nauwer dan vooren twelck oock onbequame formen sijn, sulckx datmen de rechte straten bij gemeene regel voor best houden mach.

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<sup>96</sup> In the printed version the words 'gelijk hier angewesen wort' is added here and all the streets are indeed connected by bridges in the printed illustration of the city, in contrast with that in the manuscript. This was probably Hendrick Stevin's addition.

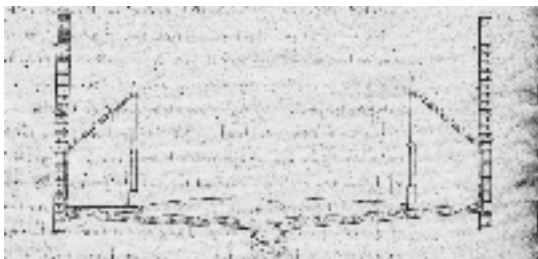
<sup>97</sup> In the margin: 'Rioler'.

<sup>98</sup> In the printed text: 'gelijk in d'ander nevenstaende form'.

The disposal of rainwater should be planned at the start and the streets should be designed for convenient drainage.

In some places one puts a gutter in the middle of the street.

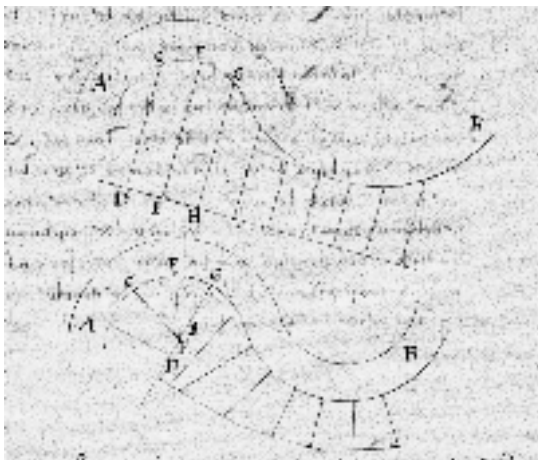
Elsewhere two gutters one on each side alongside the houses, with the street being highest in the middle: [ill. 44] There is also a third way that is the best namely a covered watercourse in the middle under the street three or four feet high, and equally wide with small covered side gutters running from in front of the houses to the watercourse in which the water comes through iron grates or plates with holes, so small that no large stones, wood or other things that cause a



ill. 44

blockage can get in it;<sup>80</sup> with these covered watercourses one does not get such blockages, piling up of mud in the streets, or a smell as one does in other towns. In towns that do not have any rivers or canals in them one lets the rainwater run through the gates in the town walls.

In this illustration long straight streets are drawn everywhere: and while some prefer curved ones, considering it to be delightful, so that as one walks one constantly sees variety in the buildings, one could reply firstly that seeing many beautiful buildings at once is a more pleasant sight than a few. Secondly that curved streets produce an inappropriate form of houses and plots. Let A, B in this first illustration be a curved street, where the plots are separated by straight parallel lines such as C, D, E, F, G, H. This being the case, the hall coming on the street has one corner D, C, E oblique and the other one C, E, F acute, of an inconvenient shape, and awkward for installing square tables box-beds, cupboards and the like. But when one does not draw the lines parallel, so that the halls on the street side have two equal angles, as in this second illustration, so [ill. 45] some of the lots and rooms are



ill. 45

<sup>80</sup> Cf. for this passage Isaac Beeckman's commentary, 'Journael', fol. 232v. lines 27-29.

De teijckening der Stadt van Straten en blocken opt landt gedaen sijnde, zoo ist oirboir over het toecomende gebou, keuren te maecken, die afte leesen, en met geplacke brieven int openbaer brengen *met insicht van t' vermogen der gemeente die bouwen sal en na den eijsch van alle omstandigheden die af te lesen*. Als dat niemant hem en vervorderen te bouwen over de geteijckende of angewesen linien, op verbeurte van dat weerom af te breecken en te betalen de breuck daer toe gestelt. De voorgevels der huijsen langs de straet te moeten commen in rechte linie dieder angewesen is. Tegen brant niet dan hart dack te mogen leggen. Ten selven eijnde elck huijs sijn pompte te moeten hebben. Elck huijs ande straet-sijde twee viercanten hooch te moeten sijn. Elck huijs sijn kelder te moeten hebben. Die willen, sullen zijdmueren van haer nabuijren meugen gebruijcken mits betalende t'geen sij met malcander verdragen, of anders [...] niet comende<sup>99</sup> alsdan [tussengevoegd], na datter sal gewesen worden van sulcke andere alsmen oirboir verstaen sal. Oock ist nodich Amptlien te belasten<sup>100</sup> van op de gestelde oirden des gebous acht te nemen, en de overtreders scherpelick te bekeuren, want anders valter na goede teijckening een onoirdentlick gebou, twelck daer na niet sonder swaricheijt en souden connen verandert worden, om de groote verlooren costen dieder vallen moeten.

Vande oirdening der kercken en Tuychhuysen [missing]

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<sup>99</sup> Here 'alsdan' is deleted; in the printed text: 'alleen anders'.

<sup>100</sup> In the printed text: 'te veroirdenen en die te belasten'.

many times wider behind and narrower in the front which are also inconvenient shapes, so that one can as a general rule hold straight streets to be the best. Now that the town has been drawn with streets and blocks on the land, it is proper to make rules for the buildings that will come, that can be read in ordinances posted in public giving insight into the authority of the community that intends to build there according to the requirement of all the conditions to be read there. Such as that nobody may proceed to build over the drawn or otherwise indicated lines, at the risk of having it demolished and having to pay for the breach that occurs there. That the façades of houses on the street have to be in a straight line as is shown there. Against fire to place nothing but a hard roof. For the same purpose each house to have its pump. Each house on the street side to be two squares high. Each house to have its cellar. Those who wish, may use the side walls of their neighbours on condition they pay that which they have mutually agreed or otherwise in that case not coming [inserted], that which is considered to be reasonable by others. It is also necessary to urge civil servants to take heed of the required design of the buildings and to impose heavy fines on people who offend against it, because otherwise after a good design one gets a badly ordered building, which cannot be changed later without difficulties, because of the great waste of money that will occur.

On the layout of churches and houses of correction [missing]



Van Looven voorde Huijsen op beijden sijden der straten.

H. Stevin, *Eenighe Stucken der Crychconst*, K.B. 128-A-9-II, fol. 9v-10r.

Het is te weten datse groot gerijf geven, want vooral de huijsen van een Straet wel oirdentlick gemaect sijnde, gelijk, in sommige plaetsen gebeurt, men can al de stadt deur gaen, buijten regen, buijten slijck, onverhindert van wagens en paerden, die over de straet tusschen beijde de looven deur rijden : Als de Son heet schijnt soo canmen op deen of d'ander sijde inde coele schaeuwe gaen. Al twelck niet alleen en sijn angeneame dingen voor de rijke maer oock tot voordeel der Armen, die den cost moeten winnen al gaende langs de straten, wiens cleeren eens doorregent sijnde tottet lijf toe geen ander drooge en hebben om an te trecken, diens coussen en schoen inde modder haest verslijten en gedeurlick mett natte voeten gaen, veroirsaeckende veel siekten die daer uijt volgen,— welcke smettelick sijnde van hemlien totte rijke wel geraecken, daerom als de rijke het bouwen van sulcke looven int gemeen helpen voorstaen, zij souden hun eijgen saecke oock bevorderen.,—

De form dier loven met haer goten<sup>101</sup> daer int [...] hoofstick breeder afgeschreven is sijn als hier onder

[Illustration?]

Vande Lycksydighe Vergrooting Der Stadt.

H. Stevin, *Eenighe Stucken der Chrychconst*, K.B. 128-A-9-II, fol. 10r.-12r.

De voorgaende Stadt is teenemael, soo inwendich als uijtwendich van lijckzijdige form. Maer want in welvarende Steden dickwils vergrooting geschiet; het welck alsser niet opverdocht en waer met onoordentliche onlijcksijdicheijt mocht toegaen, deur voorsteden, spelhuijsen en andere gestichten, diemen buijten de Stadt boude en niet sonder groote scha en swaricheijt en souden connen afgebroocken worden, om met een lijckzijdige oirdening te vergrootten, soo machmen om daer tegen te voorsien aan beijde de smalste eijnden der Stadt teijckenen sulcke straten en blocken, gelijk inde Stadt, soo de getippelde linien buijten de stadt anwijsen, vercoopende alleenelick de blocken om elck die te besajien of betimmeren na zijn wille en dat tot desen eijnde: Beslooten

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<sup>101</sup> Inserted: 'met haar goten'.

On galleries in front of the houses on both sides of the streets.

H. Stevin, *Eenighe Stucken der Chrychconst*, K.B. 128-A-9-II, fol. 9v.-10r.

It should be known that they are highly convenient, because especially when the houses of a street are made in orderly manner, likewise in some places it is so that one can go throughout the town out of the rain, free of mud, unimpeded by carts and horses, that ride along the street between both the galleries:<sup>81</sup> if the sun is shining one can walk in the cool shadow on one or other side. All of which are not only pleasant things for the rich but also to the advantage of the poor, who have to earn their living while walking on the street, whose clothes being sometimes soaked to the skin and who have no other dry ones to put on, whose stockings and shoes almost get worn out in the mud and who continually go with wet feet, causing many sicknesses as a result which, being infectious, will also affect the rich [from them], therefore if the wealthy promote the building of such galleries, they would also further their own cause.

The shape of these galleries with their gutters that is described in more detail in [...] chapter should be as this one below<sup>82</sup>

[illustration?]<sup>83</sup>

On the Like-sided Expansion of the Town.

H. Stevin, *Eenighe Stucken der Chrychconst*, K.B. 128-A-9-II, fol. 10r.-12r.

The preceding town is, both internally and externally like-sided in form. But since in prosperous towns expansion often occurs; which if it is not clearly thought out and where it might take place with disorderly unlike-sidedness, through suburbs, pleasure houses and other buildings, that people have built outside the town and which could not be demolished without great damage and inconvenience, if one is to expand with a like-sided layout, so one can prevent this by planning these streets and blocks similar to those in the town at both the short ends of the town, as the dotted lines outside the town indicate, selling only the blocks for each person to sow or build as he wants and that

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<sup>81</sup> Cf. for this passage Isaac Beeckman's commentary, 'Journael', fol. 232v. lines 30-32.

<sup>82</sup> The printed version reads 'H:S: De Form deser Loooven is beschreven inden Huysbou'. See appendix E, Notes on the unfinished *Huysbou*, p. 493; H. Stevin, *Materiae Politicae*, 1 *Onderscheyt van de Oirdeningh der steden*, Hoofstic 6, p. 31.

<sup>83</sup> The drawing of the cross-section of the street and the galleries in front of the houses is shown here. This drawing however belongs to the description of the sewer under the street in K.B-128-A-9-II fol. 8v.

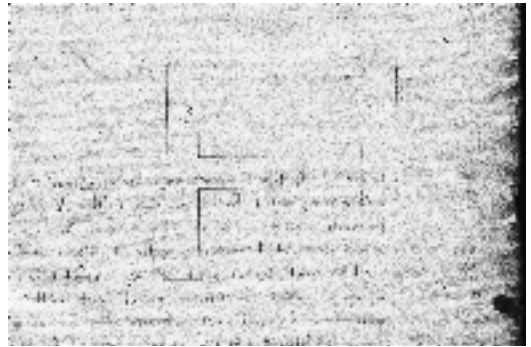
wesende de Stadt te vergrooten, men zal dat doen ande voorschreven twee smalste einden, worpene wallen en bolwercken in de grachten GH, IK, daer sij uijtgecommen zijn, en maken de vergrootingh an elcke sijde evenveel, op dattet geene nu t'middel is, het middel mach blijven, soo wel om het boveschreven gemeen gerief, en op dat degeene die haer huijsen en erven daer hebben tot geen scha en commen wannermen anders deede, als om de lijcksijdicheijtswille. En want de voorschreven getippelde straten buijten de stadt onbebout sijn bleven, soo sal daer me voorkomen sijn de swaricheijt van huijsen of gestichten af te moeten breecken, omlijksijdelick te bouwen. Angaende nu ijemant seggen mocht, dat de stadt hier me seer sal verlangen sonder verbreden: hier op antwoorde ick mijn meijninge niet te wesen tot verbredening te commen, al soudese thienmael of meermael langer worden dan breed om dese reden: Wanneer het middel of Marckt der uijtermaten groote Steden verre van eenige stadtpoorten is, soo vallet beswaerlick, voorde gheene die daer dagelicx van buijten moeten brengen versche cruiden, fruijten, en ander leeftocht; oock voorde Ingesetens die dickwils buijten de Stadt gaen in hun tuijnen en speelhuijsen, oft die int groen willen gaen wandelen, om hunlien te vermacken: Al twelck voorkomen wort met groote Steden te veroirdenen die niet te breed ensijn, als deese hebbende inde breede binnenswals 5820 voeten, daer af men de 20000 reeckent op een uijer gaens, sulcx dat men over al ten hoogsten maer den helft vandien te weten 2910 voeten vande wallen en is. Doch soot een Stadt waer gelijk Babilon was, drie dach reijsens lanck, en datmen om al te groote lengde te schouwen oirboir verstonde sijdeling waert te vergrooten, soo soudemen dat meugen doen met uijtsteeksels Cruijswijs opde lange stadt commende, soo breed en in sulcken [~~'form'~~] oirden als de voorgaende, gelijk bij voorbeelt met dese nevenstaende<sup>102</sup> form angeveesen wort, waer mede [ill. 46] men over alsoo na soude sijn om buijten de Stadt te commen, en alle toevoering gerievelick te hebben als vooren.

Tot hier toe geseijt zijnde van de form der grootste steden, soo sal icker noch wat bij vougen vande cleenste, daermen schansen onder reekenen mach,

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<sup>102</sup> In the printed text, 'nevenstaende' is omitted.

to this purposes: It being decided to expand the town, it shall be done at the above-mentioned two short ends, putting up walls and bastions in the canals G, H, I, K, out of which they were built, and making the extension just as large on each side, so that what is now the centre may remain the centre, both for the general convenience as described above, and because those who have their houses and plots there come to no harm if something else was done, and to preserve like-sidedness. And because the above-described dotted streets outside the town have remained unbuilt-on, this will prevent the nuisance of having to demolish houses or buildings in order to build with like-sidedness. Supposing now someone were to say, that in this way the town will become longer without becoming broader: I would answer that it is not my intention to make the town broader even if they were ten times as long, for the following reason: if the centre or market of an extremely large city is a long way from the city gates, it becomes a nuisance for those who have to bring fresh herbs, fruit, and other foodstuffs from outside every day: also for the Inhabitants who often go out of the city to their gardens and country houses, or who want to walk in the countryside, to amuse themselves, all of which is prevented by planning large towns that are not too broad, if these are 5,820 feet in breadth within the walls, calculating 20,000 an hour so that everywhere one is at most only the half namely 2,910 feet from the walls,<sup>84</sup> however, even if a city was like Babylon, in length three days' journey, and that in order to avoid all too great a length one thought it proper to extend it sideways, one could do



ill. 46

that with crosswise projections adjoining the long side of the city, as broad and in the same disposition as the preceding, as one can see in the example in the illustration opposite, so that [ill. 46] one can go out of the city from every point and have all one's supplies conveniently as before.

Having spoken so far about the shape of the largest cities, I will now add something about the smallest, among which one may include redoubts,<sup>85</sup> for

<sup>84</sup> Cf. for this passage Isaac Beeckman's commentary, 'Journael', fol. 232v. lines 33-34.

<sup>85</sup> This whole passage is missing in the printed version and may also in fact come from the *Crychconst*. Nonetheless it makes a good transitional text before the next passage about the Fortification of squares from small to Large.

Laet tot dien eijnde ABCD een viercante schans beteyckenen daer in staende vier rijen hutten E,F,G,H, nevens malcander met straten tusschen beijden al even breed, gelijk tot sommige plaetsen gedaen wort. Maer om nu te verthoopen de oirdening van hutten die mij beter bevaldt, soo stel ick hier nevens de teijckening van een ander viercante schans IKLM [ill. 47] hebbende elcke sijde binnens ware vande selve langde als dander, daerin oock staende vier rijen hutten NOPQ, elck soo lanck en breed als de vier rijen in d'eerste form; maer anders vervoucht, te weten soo, datter int middel blijft een groot viercant leedich perck, daermen in comt deur vier deuren, int middel van elcke rijs, welck perck mette storm plaets even soo groot moet wesen als de leedige plaetsen van dander schans ABCD. Dit soo zijnde, ick seg mij de laetste oirdening beter te bevallen dan d'eerste, om redenen dat angesien elcke schans evenveel huisings en oock eveveel leedige plaets heeft, so schijnt de groote ledige plaets of viercante ruijmt der schans IKLM, gherieviger voor Soldaten of inwoonders, dan de verscheijden cleender plaetsen, of straten van d'ander schans.

Verstercking der vierhoecken van kleinder tot Grooter  
[incomplete]

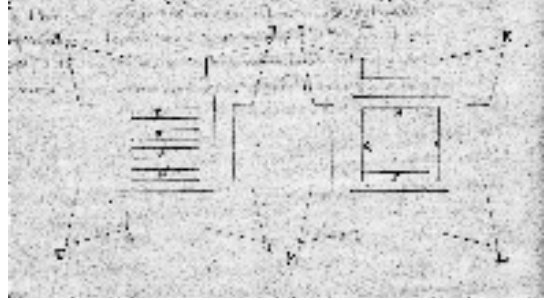
H. Stevin, *Eenighe Stucken der Chrychconst*, K.B. 128-A-9-II, fol. 18r.-20r.

De manier der verstercking van den kleinsten vierhoek is als A met 4 bolwercken, een op elken hoek, Maer grooter moete wesen, als B met 6 bolwercken, een op elcken hoek, en een int middel van elck der twee langste gordinen, maer noch grooter moete wesen, met 8 bolwercken als C, namelick een op elcken houck en een int middel van elcken gordijn, waer uijt, en uijt de voorgaende groote Stadt, de meijning van andere middelbare en grooter licht te verstaen is, Staet noch te gedencken, dat soomen den bolwerck punt verstont sterck genouch te wesen met den hoek eenige weijnich trappen<sup>103</sup>

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<sup>103</sup> In the margin: 'Graden'.

this purpose let A, B, C, D represent a square redoubt containing four rows of huts E, F, G, H, next to each other with streets between both equally wide, as is done in some places. But to show now the layout of huts that I prefer, I present opposite it the drawing of another square redoubt I, K, L, M [ill. 47] each side of which from the inside being of the same length as the other, with another four rows of huts N, O, P, Q in it, each as long and wide as in the first figure; but differently disposed, that is to say, that in the middle there remains a large empty square space, that one can enter by way of four doors, in the middle of each row, which space with the parade ground



ill. 47

must be just as large as the empty areas in the other redoubt A, B, C, D. This being the case I say that the latter design pleases me more than the former for the reason that seeing that each redoubt has as much housing and as much empty space, so the large empty area or square space of the redoubt I, K, L, M seems more pleasant for soldiers or inhabitants than the separate smaller spaces, or streets of the other redoubt.

Fortification of squares from small to large<sup>86</sup>

[incomplete]

H. Stevin, *Eenighe Stucken der Chrychconst*, K.B. 128-A-9-11, fol. 18r.-20r.

The manner of fortifying the smallest square is as in A with four bastions, one on each corner, but if it needs to be larger, as in B with 6 bastions, one on each corner, and one in the centre of each of the two longest curtains, but needing to be still larger, with 8 bastions as in C, namely one at each corner and one in the middle of each curtain, whence and from the above mentioned great city, the notion of other middle-sized and larger cities can easily be understood, it remains to bear in mind that if one thought to make the bastion point strong enough with an angle of a few degrees less than straight, the faces

<sup>86</sup> This entire passage is missing in the printed version; it may come from the *Chrychconst*. Nonetheless the system of fortifications it proposes relates directly to that of the doubling of the flanks of the bastions next to the corner bastions in the '*Vande Form der steden*' of which Hendrick Stevin remarks that it will be discussed in more detail in the *Sterctebou*.

minder dan recht te maecken, de puntsijden<sup>104</sup> dan soo veel te meer bescherming van haer nevenstaende groote strijckweren souden hebben, als in de form D. Voorts datmen om overmate sterckte der groote steden op de sijden, mits de veelheijt der bolwercken op rechte linien die hoecken mette meeste buijte wercken can versien.

Wijders noch dat men de groote steden met alleenlick de helft der vier blocken huijsen, op de vier hoecken commende te verliesen, can verstercken als inde form E te sien is. [ills. 48-49]

#### VIII.4 VANDE HANDEL DER WATERSCHUYRING

– Vande Waterschuyring int gemeen [missing]

Een Rivier haer in tween scheidende, en die deelen tot een ander plaets weeroom versamelende, het corste heeft de snelste stroom en meeste schuyring

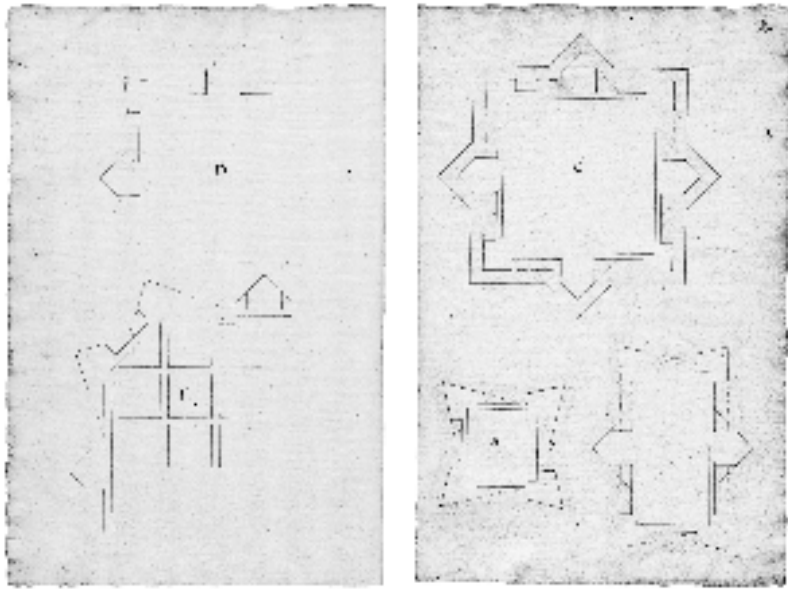
Isaac Beeckman, 'Journael', fol. 206v., line 15 – 207r. line 5

Waterschuering [in the margin]

Een rivier haer in tween scheidende, is die deelen tot een ander plaets wederom versamelende: het cortste heeft de snelste stroom ende meeste schuering.

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<sup>104</sup> In the margin: 'facen'.



ills. 48-49

would have just as much more protection from its adjacent large flanks, as in illustration D. Further that one may avoid superfluous emphasis of fortifications of larger cities at the sides, on condition the number of bastions on the straight lines are provided with the most outworks.

Furthermore that one may fortify great cities with the loss only of the half of the four blocks of houses on the four corners, as can be seen in illustration E. [ills. 48-49]

#### VIII.4 ON THE BUSINESS OF SCOURING WATER

– On scouring water in general [missing]<sup>87</sup>

A river dividing in two, with these parts converging again in another place, the shortest branch has the swiftest current and the greatest amount of scouring.

Isaac Beekman, 'Journael', fol. 206v., line 15 – 207r. line 5

Scouring water [in the margin]

A river dividing in two, if these parts converge again in another place: the shortest branch has the swiftest current and the greatest amount of scour-

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<sup>87</sup> This subject is treated separately in the *XII Boec Vanden Handel der Waterschuyring Onses Vaders Simon Stevin in het Wisconstich Filosofisch Bedryf van Hendrick Stevin*. It is not clear however which part of it was intended to be printed in *Huysbou*.



Want daert beyde een is, ist even hooghe, ende als yet langher daelt ende niet leegher en komt dan dat corter daelt so moet het tragher gaen. Doch t kan gebeuren dat het kortste trager, loopt, te weten, als haren inganck seer eng waer ende daer achter breet of int middel veel dieper dan aen de eynden. Daerom moet men nieuwe vaerden aen rivieren korter graven dan den wech, die het water in de rivieren loopen moet eert an de leeghe mont van die nieuwe vaert geraeckt als ick segghe het cortste heeft sleeste<sup>105</sup> stroom, versta ick caeteris paribus.

Alser een kleyn rivierken neffens een groote gegraven wort, onder ende boven daer in kommende, so sal dat kleyn rivierken altyt neerwaerts loopen, indien de groote riviere altyt neerwaerts loopt. Maer soder daer inde groote ebbe ende vloed gaet, so gebeurt wel dat aen beyde de monden der kleyne het water seffens in of uylloopt, te weten als de kleyne droogh loopt, en geschier voornementlick in krekken die langst syn en daer veel plat landt by is op de langhde van 400 stappen.

Te verclaren de gemeene regel van schuyring deur wantyen<sup>106</sup>  
Isaac Beeckman, 'Journael', fol. 207r. line 6 – 207v. line 7

[ill. 50]

De kroke, daer de vloed op een selfde tyt so wel aen C als aen E incompt en hebben gemeenlick gheen deurgaende schueringh: Want aen D, daer de stroomen malcanderen ontmoeten (hier te lande genoempt wantijen), en valt gheen schueringh, ten ware datter aen D eenen inham ware daert water introck tot aen F, maer daer in sal altyt aenwas geschien.

schuring met rivieren

Alsmen kreecken maeckt uyt revieren,so moetmense maken van schoorkant tot schoorkant, en niet ande strandtsyde, want het sandt, daer synde, beledt als dorpel het water met overvloed in de krekken te schuyven.

Men sal oock de monden vande kroke legghen na de scheute der groote riviere, als het water van A kommende, komt beter in C dan oft van A in E kommen moest, ende uyt E gaet het gemakelick, omdat het revierwater ooc na B loopt. Het water verliest in water syn schuerende kracht.

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<sup>105</sup> De Waard is correct in reading 'sleeste' here. In Hendrick Stevin's printed text we read 'snelste'. This is logical in the context. Perhaps Beeckman was unable to read Simon Stevin's handwriting correctly while his son could.

<sup>106</sup> De Waard correctly read 'schuyven'. It is possible however that 'schuyren' was intended.

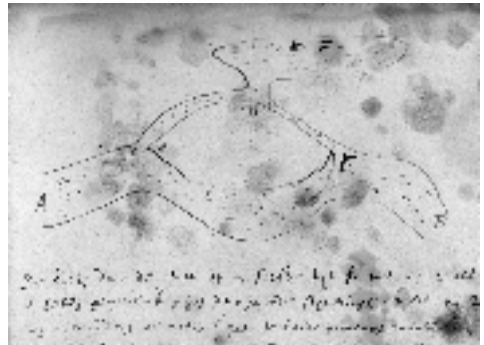
ing. Because since both parts are one, it is equally high, and the one that descends by a longer route and does not become more shallow than that which descends by a shorter route so it must flow more slowly. Yet it can happen that the shorter branch flows, more slowly, namely, if its entrance were very narrow and broad further on or if it is much deeper in the middle than at the ends. Therefore one should dig new waterways onto rivers shorter than the route that the water in the rivers must flow before it reaches the unimpeded mouth of this new waterway as I say the shortest branch has the swiftest ceteris paribus.

If a small stream is dug next to a large one, lower than it and the one above it flows into it, that small stream will always flow downwards, if the larger river always flows downwards. But when ebb and flow occurs in the larger one, it can happen that at both the mouths of the smaller one the water flows in and out at the same time, that is, when the smaller runs dry, this occurs mainly in the creeks that are the longest and where there is much land nearby to a length of 400 paces.

To explain the general rule of scouring through neap tides  
Isaac Beekman, 'Journal', fol. 207r. line 6 – 207v. line 7

[ill. 50]

The creek, when the flood tide enters both C and E at the same time and neither of them have any common through scouring: because at D, where the two streams meet each other (here in this country called 'neap tides'), there is no scouring, unless there were an inlet at D where the water could enter as far as F, but accretion will always occur there.



ill. 50

### Scouring with rivers

If one makes creeks out of rivers, so one must make them from shore side to shore side and not on the beach side, because the sand, being there, forms a bar preventing any excess of water flooding into the creeks.

One should also situate the mouths of the creek behind the dam of the larger river, as the water flowing from A, flows better into C than if it has to flow from A to E, and it can flow easily from E, because the river water also flows behind B. Water loses its scouring power in water.

Tis eenen gemeenen regel dattet revier water sonder ebbe ende vloet totte nauste plaetsen ten diepsten is, maer in zeewater en komen de klyne kreeke van 3 of 4 voet breed uyt zeestrandt naulick sienlick greppen<sup>107</sup> maken, maer worden met de vloedten so seer geeffent alsse met de ebbe verdiepen: maer seer groote kreen als de sluyscher haven cryght groote diepte:want onder evesnelle stroomen moeten de breedste diepst worden, dewijlen desen daer in vallende daer door niet en verminderen, ende de kreen en souden en konnen niet diepen sonder te verbreedden, en dat het sandt onder afvalt. hiertoe dient oock de groote kreen tusschen Vrankrijck en Engellant, welcke niet tegenstaende sy seer breed is, nochtans de duytschen see een groote boesem synde daer de spaensche met haer getye tot en in schuert, so is die kreen (so ick se so noemen mach) seer diep. Sooder benevens de Sluyscher haven gemaect wierden noch seven anderen gelycken al loopende in die selfde verdroncken landen, so en souden den stroom vant Sluyscher gat so diep niet worden en dat het verdroncken landt dan weer vervult souden syn. En wint kan oock het water ophouden also datter in sommige gelegentheyt van kreenen het water ebt alst behoorde te blijven en ter contrarien.

Men kan oock in sommige gelegentheyt van rivieren een bequaem rondt stuck lants gansch in stroom bevanghen, als de rivier bijna een ront maecken, dan sal men dat met een kreecke an een maken, doch also dan de kreen so uijt niet en [zijn] dat den loop van de groote riviere te veel vertragen ende also den bocht versanden. daerom salmen met hoofden, cramming of crippling de kreen in sijn behoorlick naute houden ende de scheute des waters synen oude wech [...] <sup>108</sup> doen verkiesen.

– Vande Schuyring met sluysen [missing]

Isaac Beekman, 'Journael', fol. 232v. lines 35-36

*Sluysen* [in the margin]

*Schuerende water maeckt door den wijde sluyse opcanten meer schueringh t selve water door een naeuwer sluyse op*

Isaac Beekman, 'Journael', fol. 233r. lines 1-2

Sluysen wijder dan na behooren vervuijle want die vervuijlen van binnen ende de deuren en connen niet toegaen.

Isaac Beekman, 'Journael', fol. 207v. lines 8-14

Landen schynen te krimpen [in the margin]

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<sup>107</sup> In the printed text: 'grippen'.

<sup>108</sup> Deleted: 'te'.

It is a general rule that river water without ebb and flow is deepest in the narrowest places, but in sea water a small creek of 3 or 4 feet wide on a beach can hardly make visible gulleys, but with flood tides it becomes level just as it becomes deeper with the ebb: but very large creeks such as the sluices in a harbour acquire great depth: because among equally fast streams the widest must become the deepest, and the creeks that flow into it do not therefore diminish, and the creeks could not become deeper without becoming wider, and that the sand underneath must fall away. the great creek between France and England serves as an example of this, which notwithstanding that it is very wide, yet the German sea being a great outlet, the Spanish sea scours it with its tides, so this creek (if I may call it so) is very deep. So that if besides the harbour Sluis seven other similar ones were made all flowing in the same flooded countryside, then the current of the Sluis sea-gate does not become so deep and then the flooded land becomes shallow once more. And wind can also hold back the water so that the water in creeks in some circumstances ebbs when it ought to remain and vice versa.

In some circumstances of rivers one can also surround a convenient circular piece of land in the full stream, if the river makes an almost complete circle then one may join it up with a creek, but since the creek cannot then [flow] out anywhere it slows down the course of the great river too much and in this way the curve becomes silted up, therefore with breakwaters, dykes or narrowing the creek keeping it in its proper narrow course and the course of the waters can choose its old channel.

– On scouring with sluices [missing]<sup>88</sup>

Isaac Beekman, 'Journael', fol. 232v. lines 35-36

Sluices [in the margin]

Scouring water makes a greater amount of scouring at the sides through a wide sluice than does the same water through a narrower sluice.

Isaac Beekman, 'Journael', fol. 233r. lines 1-2

Sluices wider than is proper become blocked because they get dirty from the inside and the gates cannot shut.

Isaac Beekman, 'Journael', fol. 207v. lines 8-14

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<sup>88</sup> This subject is treated separately in *XII Boec Vanden Handel der Waterschuyring Onses Vaders Simon Stevin* in H. Stevin, *Wisconstich Filosofisch Bedryf*. It is not clear however which part of it was intended to be printed in *Huysbou*.

na de bedyckinghe en worden de landen niet hoogher, ja en datter de sprinckvloedten niet op en kommen, soo leeghen sy en crimpen in, en so eenighe segghen gageslaghen te hebben, het gewas der vruchten afgemaect wordende duerst jaerlickx verminderen. Voor Sluys is in weynich jaren 4 of 5 voet verhooghinghe geschiet: ende op plaetsen naerder de groote rivieren als de Schelde, Maes en IJssel bevindt men den anwas op sulcke tit hoogher om bekende oorsaken.

Isaac Beeckman, 'Journael', fol. 207v. lines 15-26

Havens open te houden [in the margin]

De beste maniere om havens open te houden en grote schepen te ontfanghen is doort schueren, met twee sluysen diemen bij beurten open doet daarmede den heele houer diep gehouden wort. En soomen hoofden diep in see duer strecken die verwering des mont vaent in vallen des sandts, ende het water verliest anders [te zwich] in de breede kommende syn schuerende kracht, daert met die hoofden schuert tot daer de zeer diep diepte krijght. Also soudemen te Middelborgh behouden deur de duynen twee nieuwe vaerden te delven vande stadt noortwaert, want na de Vlaemscher cant neemt den anwas te seere toe. Steden als oostende op de Zeestrand en verder uytstekende dan de gemeyne streke van de buytenkant der duynen lijden geweldighe schueringh der zee-stroomen, en tis te vermoeden datse eerst so niet gelyden [gelycken?/gelegen] en is maer dat de duynen afgespoelt sijn en sij blyven staen door cost van arbeydt.

Sluysen die bequam sijn [in the margin]

Isaac Beeckman, 'Journael', fol. 207v. lines 27-38

Alsmen met sluysen veel wateren tseffens loost, hoe wel het so langhe niet en liepe, nochtans maeckt men daer door de meeste schueringh, want een kleynen water syn meeste macht der schuering gedaen hebbende en sal deur langhe loopen niet veel meer dan diepen, volcht andersins alle rivieren geduerlick loopende soudent altyt dieper en dieper worden, gelyck 400 pont lang in den schale ligghen soude eerst 500 pont in dander op soude doen gaen, twelck 600 pont strackx doen. Nochtans kan men de sluysen wel te groot maken als grooter sijn dan de santkreke daert water deur kompt, want dan verkleynt sy, daerom moet daer een weynich [mis/win/min] water door konnen dan door het dryhouckich gat daer twater door kompt. De kreke in cley hebben stylder kanten dan in sandt, gelyck oock doen die met kripping en ryswerck gemaect en onderhouden worden.

Land seems to get smaller [in the margin]

If, after being dyked in and if the land does not get higher, yes and because the spring tides do not reach them, they drain away and shrink, and so some people say that they have noticed, the crop of fruit being harvested diminishes each year. In front of Sluis a heightening of 4 or 5 feet occurred in but a few years: and in places near the great rivers such as the Scheldt, Maas and IJssel one finds the accretion higher at such times for reasons we know already.

Isaac Beeckman, 'Journael', fol. 207v. lines 15-26

Keeping harbours open [in the margin]

The best way of keeping harbours open and being able to receive large ships is through scouring, with two locks that one opens in turn thereby keeping the whole chamber deep. And if one builds breakwaters deep into the sea by removing this erosion at the mouth from sand falling in, and the water otherwise loses its scouring power too quickly becoming broad, while with these breakwaters it scours till it gets a very deep depth. Thus if one wanted to protect Middelburg, one should do so by digging two new waterways through the dunes northwards from the town, because on the Flemish side the accretion augments too much.

Towns such as Ostend on the coast and jutting further out than the general stretch on the outside of the dunes endure violent scouring from the sea currents, and it is to be presumed that they did not first suffer [?] this so much and it is rather that the dunes have been eroded and they remain as they are because of the expense of the work involved.

Sluices that are convenient [in the margin]

Isaac Beeckman, 'Journael', fol. 207v. lines 27-38

If one drains many waters with sluices all at once, although for a long time they did not flow through, none the less one makes in this way the greatest amount of scouring, because a small quantity of water having given most of its power for scouring will not deepen much more through flowing a long time, it follows on the other hand that all rivers flowing constantly will always become deeper and deeper, just as 400 pounds that lies long in the scale would first make 500 pounds rise in the other scale, which 600 pounds will shortly do. Nonetheless one can make the sluices too large if they are larger than the sand creek that the water comes through, because then they become smaller, therefore a little less water must be able to flow through it than through the triangular opening that the water flows through. Creeks in clay have steeper sides than in sand, the same is also true of those that are made and maintained with groyne and mat work.

Isaac Beeckman, 'Journael', fol. 208v. lines 11-17

Ick moet te Middelborgh vernemen hoe breed en diep de sluysen daer altemael tsamen syn die in de havens schueren. S gelyckx t' Amsterdam, te Delfshaven, te Rotterdam, te Goeree.

Hoe wyt ligghen de twee dycken van malcander vande haven ten Middelborgh. Ick moet inde haven te Middelborgh op leegh water meten de schoenheyt der syden vande kiel der havens, oock te Vlissinghen. Ick moet vraghen na de grootheyt en gestalt van t gat der sluys te duynkercke.

– Van de sluysen (Van de form der sluysen die mij best bevalt) [missing]

– Van de havens [missing]

Schuren met ebbe en vloedt in besloten dobbel houders,  
Isaac Beeckman, 'Journael', fol. 207v. line 39 – 208r. line 19

Schueren met ebbe en vloedt [in the margin]

Schueringh met louter ebbe en vloet in besloten dobbel houders sonder rivieren daer in te kommen, geven meer geriefs, en syn beter havens dan met rivieren in dit aensien. ten eersten datse gheen schadelicken ysganck onderworpen en syn, ghelyck de rivieren, maer meughen alle schepen daer in vrijelick verwinteren, als de nieuwe haven van Delfshaven. ten tweeden dobbel houwens deur het zeestrandt schuerende en brenghen geen saendt ande havendorpel gelyck de rivieren wel doen; volcht den besloten dobbel houwer heeft alleenlick te schueren deur het strandt des ouvers, om dat open te houden, daer de rivieren noch bovendien moeten overwinnen het sandt datse selfs overvloede-

Isaac Beeckman, 'Journael', fol. 208v. lines 11-17<sup>89</sup>

I must find out in Middelburg how wide and deep the sluices are altogether that scour the water in the harbours. Likewise in Amsterdam, in Delfshaven, in Rotterdam, in Goeree.

How wide apart are the two dykes of the harbour of Middelburg. In the harbour of Middelburg I must measure the incline of the sides of the channel in the harbours at low water, also in Flushing. I must ask after the size and form of the gate in the sluice in Dunkirk.

– On sluices (On the shape of the sluices that please me most) [missing]<sup>90</sup>

– On harbours [missing]<sup>91</sup>

Scouring with ebb and flow in closed double chambers<sup>92</sup>

Isaac Beeckman, 'Journael', fol. 207v. line 39 – 208r. line 19

Scouring with ebb and flow [in the margin]

Scouring only with the ebb and flow of the water in closed double chambers without rivers entering then, gives more convenience, and are better harbours than with rivers in this regard. firstly because they are not subjected to harmful drifting ice and are, similar to rivers, but all ships may freely winter in them, such as the new harbour of Delfshaven. secondly double chambers by scouring the beach do not bring any sand to the harbour bar as rivers do; it follows the closed double chamber only has to scour through the sand of the banks, in order to keep it open, seeing that the rivers moreover must still overcome the

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<sup>89</sup> In Beeckman this passage concludes the excerpt on Scouring following on from an account of how dunes are formed. In the printed version Hendrick Stevin places a comparable passage directly after the account of sluices, something that in view of its contents seems more logical. I have therefore chosen Hendrick Stevin's order. Cf. H. Stevin, *XII Boec Vanden Handel der Waterschuyring Onses Vaders Simon Stevin in Wisconstich Filosofisch Bedryf* by Hendrick Stevin. Remember that numerous examples of the reasons for sluice gates must be given.

<sup>90</sup> In the printed version of *Waterschuyring* Hendrick Stevin refers for this subject to the *Nieuwe Maniere van Sterctebou door Spilshyzen* by Simon Stevin. It is not possible however to find out which part of it was supposed to be published in *Huysbou*.

<sup>91</sup> This subject is however treated separately in the *XII Boec Vanden Handel der Waterschuyring Onses Vaders Simon Stevin in the Wisconstich Filosofisch Bedryf* by Hendrick Stevin. It is not however clear which part was intended to be printed in *Huysbou*. In addition to a discussion of the different harbour containers, there is a separate treatment of the subject with the title *Van de hoofden der havens*.

<sup>92</sup> The section that Beeckman calls 'harbours' is the passage Hendrick Stevin includes about scouring harbours in closed double containers that as the latter continues 'without rivers entering then, gives more convenience, and are better harbours than with rivers'.



lick afbrenghen, en ten eynde van crancke sandt stroom op de havendorpels laten vallen. ten derden soudemen deene syde des dobbelhouwers met haer sluyse moghen gebruycken tot incommende schepen, dander tot uytvarende sonder malkanderen te ontmoeten, ten vierden souder in den sluys een somer lanck wat te vermaken valt mach men daerentusschen dander gebruycken. Hier teghen syn de rivieren gemaecte havens sonder kost, en de steden aen de Schelde, Maes en Rijn hebben t voordeel van dobbelhandel so wel verre te landewaert in als over zee.

Syn excellentie heeft door behulp van [rys/water]wercken te lynghen doen wech schueren veel hinderlicke berghen die eerst anden kant des grachts laghen daer nu veel roeden<sup>109</sup> plat landt is op weynich jaeren met kleyne kost; de stucken vielen so groot af dat de burgerye aldaer tselve met verwonderinghe dickwils quam besien.

Schepen in havens liggende maecken onder diepte [in the margin]

Isaac Beeckman, 'Journael', fol. 208r. lines 20-25

Veel schepen in een haven liggende beletten oock de schueringh, ende men bevint datter onder de schepen meerder diepte kompt, dant te vooren was, en dat het water daer onder moet met meerder gewelt, voornementlick alsoe gelaen syn. Daerom machmense hier nevens malcander doen legghen, of daermen meerder diepte begeert machmense niet deen achter dander legghen, maer nevens malkanderen.

Duynen hoe sij sus of so groyen [in the margin]

Isaac Beeckman, 'Journael', fol. 208r. line 26 – 208v. line 4

Eermen de Zype bedyckte so vergaerde het sandt lanx de zeeoever met kleyne heuvelkens, maer wantse niey hoogh genouch en waeren, het water der grote nootweste stormen isser somwijlen overgelopen, heeftse wechgespoelt<sup>110</sup> ende tsant verre achterwaerts op de gorsinghe gespoelt,<sup>111</sup> sulckx datse ten dele daer af bedeckt wiert deur [...] maer den dyck daer na geleydt synde ende het hoogwater der stormen daer niet deur noch overloopende, ten conde het sandt niet verschueren, dan vergaende deur de stercke drooghe winden voor den dyck tot hooghe duynen maer so tselfde landt onbedyckt gebleven waer, daer hadde tot te verwachten geweest datter mettertyt van selfs breede duynen souden gecommen hebben, van achter allenckx anwassende tot ande strandt

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<sup>109</sup> In the printed text: '1000 voeten', *Waterschuyring*, p. 53.

<sup>110</sup> In the printed text by H. Stevin: 'wechgeschuert'.

<sup>111</sup> In the printed text by H. Stevin: 'wechgeschuert'.

sand that they themselves deflect in abundance, and worst of all they deposit a stream of sand on the harbour bars. thirdly one may use one side of the double chambers with their sluice for incoming ships, and the other for outgoing ones without them crossing each other, fourthly should there be something that needs repairing all summer in one sluice one can meanwhile use the other one. As against this the harbours made by rivers do not cost anything, and the towns on the Scheldt, Maas and Rhine have the advantage of double trade both far inland and overseas.

With the aid of mat work in the mud his Excellency in Lingen has been able to scour many troublesome sandbanks that had first heaped up there on the side of the canals so that now there are many perches of flat land in a few years and with small expense; so much land accreted that the citizens there often came to gaze at it with admiration.

Ships lying in harbours to make depth under them [in the margin]  
Isaac Beekman, 'Journael', fol. 208r. lines 20-25

Many ships lying in a harbour also form a hindrance to scouring, and one notices that there will be more depth under the ships, than there was before, and that the water under them must flow with greater force, especially if they are loaded. Therefore one must anchor them here side by side, or if one wants a greater depth one should not anchor them one behind the other, but side by side.

Dunes how they grow in different ways [in the margin]  
Isaac Beekman, 'Journael', fol. 208r. line 26 – 208v. line 4

Before the Zijpe had been given dykes the sand piled up in little hillocks along the sea shore, but because they were not high enough, the water of great north west storms flooded over them, washed them away and spilled the sand far away behind on the mud flats, so that they were partly covered there by [...] but afterwards with the dyke having been built there and the high storm tides not washing over it, then the sand could not be scoured, then being driven by the strong dry winds in front of the dyke into high dunes but had the same land not been dyked in, then one would have expected that with time wide dunes would have come of themselves, accreting from behind as far as the

toe al daer hoogher wordende gelyck voor hollant vander Heyde af tot Pette toe gestelt is, al waer sulcke dyckage niet en had gedaen geweest. Also lichter oock eenen dyck lanckx de vlaemsche zee kant achter de duynen de welcke sijn lanck en smal, sonder dyck en soudense so kort en hoogh niet hebben kunnen vergaren sonder met groote stormen wech te schueren

Doorsake dat veel persinghen [gorsinge] langs sandighe zee stranden met geen sandt bedeckt en worden, is dat tot sulcke plaetsen het sandt cort syde en de diepte der see by wesende alle getye onder water komt en daerom nat blijft sonder gelyck het droogh tot stuyvingh te geraken ende ophooghinge.

– Van de hoofden

Lopende langs een stadt een rechte rivier; Die rontsom de Stadt te leyden  
[missing]

Vande hoofden der havens

Isaac Beeckman, 'Journael', fol. 208v. lines 5-10

Kisten voor dantsick doen goet [in the margin]

noch te segghen vande kisten te danzick. warensen niet daer souden eylanden wassen. Sy syn oorsaek van goe diepte. Daer vergaert een eylant op den sant-rinck, tsal metter tyt uyten water steken. Hoofden veroorsaken eenen rinck anders groote rivieren loopende deur verscheyden killen maken elck wel syn manier van rinck, die in malcander commen maer en syn so merckelick niet als wanneert al deur<sup>112</sup> een kille loopt.

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<sup>112</sup> De Waard transcribed 'daer' for 'deur'.

beach becoming higher there comparable to what has occurred for Holland from Den Helder to Petten, as though this damming in had not been done. In the same way a dyke has been built along the Flemish coast behind the dunes which are long and narrow, without a dyke the sand dunes would not have heaped up so short and high without great storms scouring them away.

The fact that many mud flats<sup>93</sup> along sandy beaches become covered, is because in such places the sand is not wide and the depth of the sea being such that it comes under water in all tides it therefore remains wet without at the same time the dry part turning into sand-drifts, and thus into hillocks.

– *On breakwaters*<sup>94</sup>

When a straight river flows past a town; to make it flow round the town [missing]<sup>95</sup>

On breakwaters for harbours<sup>96</sup>

Isaac Beeckman, 'Journael', fol. 208v. lines 5-10

Caissons for Danzig work well [in the margin]

Now to discuss the caissons in Danzig. If they were not there islands would grow. They are the cause that the depth is good. An island can accrete there on the ring of sand, with time it will stick up out of the water. Breakwaters cause a ring of a different sort from large rivers that each make their own manner of ring flowing through separate channels, which converge but are not so visible as when it flows through a single channel.

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<sup>93</sup> The printed text reads 'gorsingen'. *Waterschuyring* p. 54. Given the context this seems more likely. It is possible that Beeckman misread Stevin's text here.

<sup>94</sup> Subject listed in Isaac Beeckman's table of contents.

<sup>95</sup> Subject listed in Hendrick Stevin's table of contents. Seeing that the discussion here is about dams to direct the water round the town, this passage may well have been included in the section on breakwaters. The subject is discussed separately in *XII Boec Vanden Handel der Waterschuyring Onses Vaders Simon Stevin in Wisconstich Filosofisch Bedryf* by H. Stevin p. 81, *The Principal Works of Simon Stevin*, v, pp. 298-299.

<sup>96</sup> This subject is discussed separately in *XII Boec Vanden Handel der Waterschuyring Onses Vaders Simon Stevin in Wisconstich Filosofisch Bedryf* by H. Stevin. It is not clear however which part was intended to be printed in *Hynsbou*. The passage in fact comes after one about maintaining the depth of a ring of water round the town, with reference to various methods of building dams, including the additional means adopted in Danzig.

Isaac Beeckman, 'Journael', fol. 227v. lines 36-38

*Kisten te Dansick* [in the margin]

*De kasten*<sup>113</sup> *daermen te dansick in de riviere de hoofden van maeckt om diepte te krijgen, syn lanck 42 voet, breet 30 voet*

– De grachten int sant dieper gegraven worden deur santtrecking onder water dant in droge te graven deurt behulp van hosing?

Isaac Beeckman, 'Journael', fol. 226r. lines 40-41

*Welsandt* [in the margin]

*Het sant welt als het onderst water hoogher is dan de grachten, daert sandt in welt.*

Isaac Beeckman, 'Journael', fol. 226r. lines 25-31

*Grachten in sant graven* [in the margin]

*Men can alleen diepe grachten graven in sandt als men het water daerop laet comen ende alsoo het wellen te benemen. Men sal in de [...]*<sup>114</sup> *grachten met baggeringhe want [neven de] canten en breucht geen behoerlijcke diepte. Int midden dan comt een kiel [?] [totdat] het sandt alte steijlliggende souden [wellen] [?] in de kiel singket gelijk ment in een tobbe met sant en claer water gevult licht besien can*

Hoemen t'water van stilstaende stinckende grachten can ververschen

H. Stevin, *Eenighe Stucken der Chrychconst*, K.B. 128-A-9-II, fol. 14r.-15r.

[Ill. 51 – in margin]

Laet ABC een stilstaende stinckende gracht zijn, die an A eijndicht sonder deurganck,elijckt in ettelicke Steden gebeurt., Om dese te ververschen, men sal de sijden an t'ende A bemueren, ter langde van 100 of 200 voeten, als van A tot B, en soo diep als men bequamelick can, halende het sandt of de stof tusschen beijden oock seer diep uijt, om daer in overvloedich quelmwater te krijgen, gelijk mette bornputten toegaet, daer na sal an B een reetschap ge-

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<sup>113</sup> 'Kasten' is written here, in contrast with the note in the margin. Stevin meant 'kisten' or caissons.

<sup>114</sup> Illegible due to stains.

Isaac Beeckman, 'Journael', fol. 227v. lines 36-38

Caissons in Danzig [in the margin]

The caissons that are used in Danzig to make breakwaters in the river to gain depth, are 42 feet long, 30 feet broad

– *Canals are dug deeper in the sand by removing the sand under the water than by digging them in the dry land with the aid of bailing the water out*<sup>97</sup>

Isaac Beeckman, 'Journael', fol. 226r. lines 40-41

Quicksand [in the margin]

The sand wells up when the water underneath is higher than the canals so that sand wells up.<sup>98</sup>

Isaac Beeckman, 'Journael', fol. 226r. lines 25-31

Digging canals in sand [in the margin]

One can only dig deep canals in sand when one allows the water to flow over it so preventing it from welling up. In the [...] canals with dredging one should because [next to] the sides they do not reach any proper depth. In the middle then a channel [?] comes [until] the sand that lies there should [well up] [?] sinks in the channel just as in a tub filled with sand and clear water one can see light.<sup>99</sup>

How to freshen malodorous stagnant canals

H. Stevin, *Eenighe Stucken der Chrychconst*, K.B. 128-A-9-II, fol. 14r.-15r.

[ill. 51]

Let A, B, C be a malodorous stagnant canal, ending at A without continuing, such as happens in countless towns. To freshen these one should wall up the sides at the end A, to a length of 100 or 200 feet, namely from A to B, and as deep as one conveniently can, also digging the sand or other dirt between them both very deep, so as to obtain an abundance of ground



ill. 51

<sup>97</sup> This subject is discussed separately in *XII Boec Vanden Handel der Waterschuyring Onses Vaders Simon Stevin* in *Wisconstich Filosofisch Bedryf* by Hendrick Stevin. It is not clear however which part of it was intended to be printed in *Huyssbou*.

<sup>98</sup> Cf. *XII Boec Vanden Handel der Waterschuyring Onses Vaders Simon Stevin* in *Wisconstich Filosofisch Bedryf* by Hendrick Stevin p. 81, *The Principal Works of Simon Stevin*, v, p. 306 298-299.

<sup>99</sup> Cf. *XII Boec Vanden Handel der Waterschuyring Onses Vaders Simon Stevin* in *Wisconstich Filosofisch Bedryf* by Hendrick Stevin p. 81, *The Principal Works of Simon Stevin*, v, p. 306.

maeckt worden om het schoon quelmwater, dat inde diepe gracht AB comt, te brengen in d'ander vuijle gracht BC, diens water sal moeten wijcken en uijtloopen, daer het regenwater sijn losing heeft en versch water in die plaets comen.,

Tot hier toe is de meijning int rouwe verclaert, maer om nu van eenige omstandigen te seggen, soo is eerstelick te weten, dat men moet toesien, het water niet te diep uijt AB te trecken, ten eijnde het welsandt niet op en komme en ondiepte veroirsaken, maer het water op een seecker leeghde sijnde, soo moet men op houden en vertoeven tot dattet weerom opgecomen is.

Het soude voorderlich sijn het eijnde grachts AB te overwelden, op datter geen vuijlicheijt in en vergaer, die ondiepte veroirsaeckt, en de opcomst des quelmwaters verhindert, welck overwelsel gemaeckt mach worden ter hoochde van d'ander nevenstaende straten, om daer op te mogen gaen.,

Deur tgeene hier geseijt is van een gracht in een Stadt, is oock te verstaen hoemen buijte grachten om de steden can ververschen, als bij voorbeelt in dese Statdt met haer grachten ABC, alwaer DEFG het bemuert grachtken beteyckent, en H de plaets der reetschap daermen twater me uijttreckt.,

Om nu te seggen vande menichte des waters dien men op een uijer of meer can uijttrecken, ick neem een manscracht ande cruck eens reetschap ghedurich op 12 £, ende den keer op 4 stap, en des crucx langde op en voet, comt elcke keer 12 £ waters 6 voet hooch,

Dats elcke 4 stap 72 £ 1 voet hooch,

Dats elcke 1 stap 18 £ 1 voet hooch;

Dats op 8000 stap of op een uijer 144000 £ 1 voet hooch,

hier af doen de 65 £ een voet;

Dats op een uijer 2215 voet waters 1 voet hooch;

Dats op een uijer een vuijle gracht breed 24 voet, diep 1 voet, lanck 92 voet;

Dats op een uijer een gracht breed 24 voet, diep 6 voet, lanck 15 voet;

Daerom soude een man in sulcken gracht, op tus uijeren of sdaechs brengen versch water 150 voeten langde des grachts, 6 voeten diep, en twater opgetrocken 1 voet hooch;

En daerom soude een man in sulcken gracht op 10 uijeren of sdaechs, brenghen versch water 75 voeten langde des grachts, twater opgetrocken 2 voet hooch; Waer uijt te reeckenen is hoe veel meer mannen of peerden op een seker tijt souden comen ververschen.,—

water, in the same way as occurs with wells, afterwards a machine should be made at B to bring the clean ground water, that flows in the deep canal A, B into the other filthy canal B, C, the water of which has to give way and flow out, since rainwater falls into it and fresh water comes in its place.<sup>100</sup>

Up till now I have explained my views roughly, but to speak now about particular circumstances, it should first be known, that one must make sure, not to take the water from A, B too deep, so that the quicksand does not rise and cause shallowness, but the water being of a certain emptiness, so one should stop and abide one's time until it has risen again.

It would be advantageous to vault over the end of the canal A, B, so that no filth can pile up in it, which causes shallowness and hinders the rise of ground water, which vaulting may be made to the height of the other streets next to it, to be able to go over it.

Through what has been said here is of a canal in a town, it should also be understood how one can freshen outer canals around the towns, as for instance in this town with its canals A, B, C, where D, E, F, G represent the walled canal, and H the place for the equipment that one uses to get the water out.

To say something now of the amount of water that one can get out in an hour or more, I take one man power on the handle of a machine averaging 12 lb, and one time at 4 paces, and the handle one foot long, comes every time 12 lb of water 6 feet high,

That is every 4 steps 72 lb 1 foot high,

That is every 1 step 18 lb 1 foot high;

That is for 8,000 paces or one hour 144,000 lb 1 foot high,  
after this call it 65 lb one foot;

That is in one hour 2,215 feet water 1 foot high;

That is in one hour a filthy canal 24 feet wide, 1 foot deep, 92 feet long;

That is in one hour a canal 24 feet wide, 6 feet deep, 15 feet long.

Therefore in such a canal in ten hours or in a day one man can bring fresh water along 150 feet of a canal, 6 feet deep, and raise the water 1 foot high.

And therefore in such a canal in 10 hours or in a day, bring fresh water along 75 feet of a canal, raising the water 2 feet high; From which one can calculate how many more men or horses at a certain time could freshen the water.

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<sup>100</sup> Cf. for this passage Isaac Beeckman's commentary, 'Journal', fol. 226r. lines 12-14.



[ill. 52]

Isaac Beeckman, 'Journael', fol. 226r. lines 15-17

*De gemaecte vaert van Brussel heeft op vijff mijlen 42 voeten vervals.*

*Van Wyck tot Utrecht, wat verschil isser aen de vaert?*

Isaac Beeckman, 'Journael', fol. 226r. lines 18-21

*Kurck en biesbruggen kracht [in the margin]*

*Een stuck van de cleyne kurckbrugh is lanck 10 voet, breed 9 voet, dick 7 duym, groot 171/2 voet, weeght droogh 366 #. Daer connen op staen 6 man, droog seynde.*

Isaac Beeckman, 'Journael', fol. 226r. lines 22-24

*Een cleijn stuck van de biesbrugh is langh 9 voet, breed 4 1/2 voet, dick 8 duym, groot 27 voet, weeght droogh 200 # nat 472 #. Daer connen op staen, droogh synde 6 man, nat synde 5 man.*

VIII.5 HOE MEN OMT VERDRINCKEN DER STEDEN TE VOORKOMEN, BEDYCKTE LANDEN HOGER DOET WASSEN DIE DAERME OOCK VRUCHBAERDER SYN  
H. Stevin, *Eenighe Stucken der Crychconst*, K.B. 128-A-9-II, fol. 12r. – 14r.

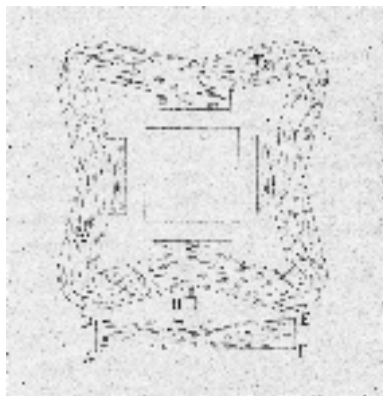
Angesien ick hier ben inde stof van oirdeninghen der Steden, en datter in veel bedijckte landen swaricheyt valt van steden, dorpen en woningen die met haer landen verdrincken en wech spoelen: Twelck can voorcommen worden deur bedijckte landen te doen hooger wassen, die daer me oock groote vruchtbaerheijt krijgen, soo en sal niet buiten wege sijn, daer af hier vermaen te doen., Int 13<sup>e</sup> voorstel des Eertcloots stofroersel is verclaert d'oorzaeck waerom het water der Rivieren hoe langer hoe hooger compt: En geseijt t'selve oirsaeck te wesen datmen daer na in bedijckte landen watermolens moet gebruijcken die int begin der Dijcking onnodig waren (want de bedijckte landen na de bedijcking niet meer hoogende, gelijk wel doen het voorlandt ende bujtewater, soo moeter sulcx uijt volghen) oock wiert geseijt dat daerom sommige landen den dijck eens deurbreeckende daer naer geduerich onder water blijven, tot datse wederom hooch genouch gewassen zijn, waer uijt oock volcht het

[ill. 52]

Isaac Beeckman, 'Journael', fol. 226r. lines 15-17

The waterway made from Brussels has in five miles 42 feet descent.

From Wijk to Utrecht, what difference is there in the waterway?



Isaac Beeckman, 'Journael', fol. 226r. lines 18-21

Strength of bridges of cork and rush

[in the margin]

A piece of the small cork bridge is 10 feet long, 9 feet wide, 7 inches thick, 17 feet large, weighs 366 # when dry. 6 men can stand on it, being dry.

Isaac Beeckman, 'Journael', fol. 226r. lines 22-24

A small piece of the rush bridge is 9 feet long, 4½feet wide, 8 inches thick, 27 feet large, weighs 200 feet when dry 472 # when wet. There 6 men can stand, remaining dry, 5 men if wet.

ill. 52

VIII.5 HOW TO ENABLE DYKED LANDS TO RISE IN HEIGHT IN ORDER TO PREVENT THE FLOODING OF TOWNS AND VILLAGES WHILE ENSURING THAT THEY ALSO BECOME MORE FERTILE

How one ensures that dyked-in lands become higher in order to prevent the flooding of towns, so that they are also more fertile

H. Stevin, *Eenighe Stucken der Crychconst*, K.B. 128-A-9-II, fol. 12r.-14r.

Since I find myself here in the subject matter of the layout of towns, and because there is a danger with many dyked-in lands that the towns, villages and dwellings and their surrounding lands be flooded and washed away: this can be prevented by making the dyked-in lands higher, so that they also become very fertile, so if I discuss it here, it is not off the subject.

In the 13th proposal of the *Eertcloots Stofroersel* the reason is explained why the water of rivers rises higher the longer they are: and I said that it is also for this reason that one must use water mills after one has put dykes round the lands which was not necessary when one began building the dykes (because the dyked-in lands do not become higher after the dykes have been built, as does happen with the foreland and washlands outside the dyke, so this result must follow) I also said that this is why some lands, remain permanently

boveschreven verdrincken en wechspoelen van woningen, dorpen en steden daer in gelegen. Dit soudemen connen voorcommen met te volgen de maniere eertijts bij de d'Egiptenaeren gebruijckt die het hooch rivierwater vanden Nilus alle Jaer eens door de sluijsen inde bedijckte landen lieten comen, tot welcken einde de woningen op dijcken en hoochden gebout wierden, om daer af geen hinder te hebben: Dat hooch water weerom afgelopen sijnde, dedden de sluijsen toe tot dattet hooch water vant ander Jaer quam, om daerentusschen het saijen wassen en maijen der vruchten verseeckert te houden, tegen de ongeregelde hooge wateren dieder op mochten vallen: Daer na het oirdentlick hoochwater weerom comende, sij stelden de sluijsen open, lieten het lant andermael volcommen en weerom aflopen gelijk vooren. Dit alsoo Jaerlicx onderhouden wesende, sij hadden daer me drie voornamelicke profijten: eerstelick alle Jaer een nieuwe mesting des lants, met overvloedige vruchten, en sonder braeck leggen, welck voordeel oock hier te lande sommige gewaer worden, die voorlanden hebben van sulcker gestalt datse met aprilsche vloedden onder water staen, en daer naer te seven Jaren naulicx eens met somer water als de vruchten opt velt staen overloopen en worden: Want soodanige eijgenaers, wagende te saijen en van vermogen sijnde een ongeluckich Jaer te verdragen, krijgen op dat Jaerlicx nieu gemest voorlant veel overvloediger en beter vruchten dan in de bedijckte landen, het tweede profijt was dat de bedijckte landen verhoogden al ofse onbedijckt waren geweest, sonder de voorschreven hindernis van waterlosingh onderworpen te sijn, en watermolens te moeten gebruijcken, en bovendien vrouger drooch te wesen. Ten derden sonder te staen in sulcken perijckel vanlant, Woningen Dorpen en Steden te verdrincken. Want een dijck schoon deurbroocken zijnde het lant en blijft daer naer niet leggen diep onder water, dan loopt weerom aff., Maer als men tgeene hier vande Egiptische maniere geseijt is, in dese landen wilde te werck stellen dat en soude voor eerst niet kunnen geschien inde oude bedijckte landen daer Woningen Dorpen en Steden te leech gebout sijn,— en onder water soudent leggen als men de hooge vloedden daer in liete comen., In nieuwe Dijkkagien eenen alleen toecommende die sijn wille doet, of Dijkkagien daer verscheijden ingelanders conden over een comen, soudet een ander bescheijt hebben, want die soudent woningen en Dorpen op de Dijcken en hoochden mogen bouwen, en de Inlating der hooge vloedden bevelen, en elck Ingeseten van die polder sijn reeckeninge daer op doen maecken. Noch staet te bemercken dat dese Jaerlicxe verhooging niet geschien en mach met zout zee water om dattet hinderlick is tottet gewas. Angaende een swaricheijt die hier mocht voorgewent worden: Dattet Aprils water niet comen mach op winter Coorn twelckmen hier in September saeijt, noch op wintergarst, raeplaet en meer andere die in April in d'eerde onder water soudent liggen en bederven,

under water, once a dyke is broken through, until they have again grown high enough, from which follows the said flooding and washing away of dwellings, villages and towns that are situated in them.

One should be able to prevent this by following the method used in ancient times by the Egyptians, who allowed the high waters of the Nile once every year to flood through the locks over the dyked-in lands, for which purpose the dwellings were built on dykes and elevations, so that this would not cause any inconvenience.<sup>101</sup> When that high water had gone down once more, the locks were closed until the high flood waters of the next year, so as to ensure the safe sowing, growing and mowing of crops in the meantime, against any disorderly high waters that might flood them: afterwards the orderly high waters rising once more, they opened the locks and let the land be flooded anew and drained again as before. This being maintained annually, they had three main advantages from it: firstly the lands were fertilised afresh every year, with abundant crops, and without it having to lie fallow, which advantage some have perceived here in this country too, where there are forelands of such a shape that with the floods of April they are under water, and afterwards for seven years are hardly flooded at all with summer water when the crops are in the fields: because these landowners, daring to sow their crops and having the means to suffer a poor year, gain much more abundant and better crops on this foreland that is every year fertilised afresh than one can in the dyked-in lands, the second advantage was that the dyked-in lands are raised as though they had not been dyked-in, without being subjected to the said nuisance of draining the water away, and needing to use water mills, moreover to dry out quicker. Thirdly without danger the land, dwellings, villages and towns being flooded. Because if a dyke is simply broken through the land does not lie deep under water afterwards, then it drains away again. But if one wanted to set the Egyptian method in operation as described here it could not happen in the old dyked-in lands at first since dwellings villages and towns are built too low – and would lie under water if one let the high flood waters flow over them. In new dyked-in areas belonging to one person, who decides for himself, or dyked-in areas where several local landowner are able to agree, the decision could be different, because they could build dwellings and villages on the dykes and elevations, and order flooding to occur at high tides, and each inhabitant of this polder could make his own calculations accordingly. It should also be said that this annual heightening must not be done with salt water because that is harmful for the crops. As for an objection that might be raised here: that April's water may not flow over winter corn that is sown here in September, nor on winter barley, rape and other crops that would lie and rot in the earth under water in

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<sup>101</sup> Cf. for this passage Isaac Beeckman's commentary, 'Journael', fol. 226r. lines 9-11.

hier op wort geantwoort: Datmen om daer tegen te voorsien, alleenelick te twee Jaren eens het water soude mogen inde polder laten sijende t'een Jaer winter vruchten t'ander Jaer somer vruchten, sulcx dat elcke mesting soude dienen voor twee Jaren. Belangende dan ijmant achten mocht daer me de verhooging des bedijckten lants minder souden zijn als vande voorlanden, te meer dat somersche en najaersche hooge vloedten daer niet op en comen waerme het voorschreven profijt soude vermindert sijn: Daer op dient tot antwoort: Datmen soodanige bedijckte landen op een selfde tijt zeerder kan doen anwassen, dan haer voorlanden twelck aldus toegaet: Genomen dattet water bij de sluijs of sluijsen ant hoogste eijnde der rivier, merckelick hooger sij dan bijde sluijs of sluijsen ant leechste eijnde der rivier, soo volcht hier uijt, dat de sluijsen ant hoogste eijnde geopent ende ant leechste eijnde gesloten, het water des heelen polders sal connen comen, ter hoochte der rivier ant hoogste eijnde, en ant leechste eijnde soo veel hooger als t'veral bedraecht. Daerom getoest zijnde tot dat de dickheijt des waters op de gront gesoncken is, en dan de sluijsen ant leech eijnt geopent, en het claer water afgetapt, den gront blijft voor datmael van soo veel verhoogt. Daer na de sluijsen weerom gesloten en het water des polders andermael wassende ter hoochde als vooren, en weerom getoets sijnde, tot dat de Dickheijt des waters op de gront gesoncken is, en dan de sluijsen aent leech eijnde weerom geopent, en het claer water afgetapt, den gront blijft voor de tweede mael van soo veel verhoogt; En dergelijcke doende soo dickwils alst den tijt des hoogen vloets toelaet, men sal die bedijckte landen veel hooger doen wassen, dan op dien tijt haer voorlanden gewassen zijn. Doch staet te bedencken dat de boveschreven aftappinge niet en behoort te geschien ten tijde van storm, als de vette gront geroert zijnde, het water dick geworden is, wantmen daerme de stof die den anwas maeckt verliesen soude,

#### Merckt

Ick hebbe eenige die in Egipten geweest zijn ondervraecht, of zij niet gageslagen en hadden, of hooren seggen hoet nu ter tijt daer mette voorschreven dingen toegaet, maer seijden datser niet op gelet en<sup>115</sup> noch af vernomen en hadden, oock hebben eenige, die daer t'schepe handelen, mij wel toegesijt van dies bescheijt te doen weten, maer tot noch toe en ister niet af gecommen, soo ijmant dieder gelegentheijt toewet, sulcx vernemen conde, t mocht sijn datmen daer int uijt soude verstaen tot voordeel streckende.,

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<sup>115</sup> Hendrick Stevin writes 'gelet' and 'en' as one word. Since that makes the meaning unclear I have separated them here.

April, one could reply: that to guard against this, one should let the water only flood the polder every second year sowing winter crops one year and summer crops the next year, so that every fertilisation should serve for two years. Since someone might think that the raising of the dyked-in lands would be less than that of the forelands as a result, all the more because the summer and autumn high tides do not flood it so that the said advantage would be diminished: one should answer: that one can make such dyked-in lands higher at the same time as the forelands; this goes as follows: assuming that the water at the lock or locks at the highest end of the river is noticeably higher than at the lock or locks at the lowest end, it follows from this, that the locks at the highest end are opened and those at the lowest are closed, the water of the whole polder reaches the height of the river at the highest end and at the lowest end it will be as much higher as the amount of the fall in the height of the water. Therefore being tested till the mass of the waters sinks no further, and then the locks are opened at the lowest end once more, and the used water is drained away, the ground remains for that occasion heightened by so much. Afterwards the locks are closed once more and the water of the polders rising to the same height as before, and being tested again, till the mass of the waters has sunk into the ground, and then the locks are opened at the lowest end once more, and the used water is drained away, the ground remains for the second time heightened by so much; and doing this as often as the time of high tides permits, one will cause the dyked-in lands to be much higher, than their forelands have increased in this time. It should be born in mind however that the said draining should not happen during a storm, because in case the muddy ground is being troubled, the water becomes thick, because one would then lose the material that causes the accretion.

#### Note

I have questioned some people who have been in Egypt, whether they had observed, or heard tell how it is done at present with the things just described, but they said that they had not noticed or been informed of it, also some merchants in ships there, have indeed promised to inform me regarding this matter, however, this has not occurred, so that if someone knows of the occurrence, could get information about it, it could be that if one understood it fully, it would be very advantageous.

# Verscheyden aenteyckeningen

## Verscheyden aenteyckeningen van metselarye, van timmeringh, van smedingh van roock

VAN METSELARYE

*Van backsteen, hartsteen en tegelen*

Isaac Beeckman, 'Journael', fol. 227r. lines 19-21

Backsteen moet gemaectt worden van goet kley ende wel gekneedt. Klijnck-aert en kan men niet houwen, maer wel slijpen.

Isaac Beeckman, 'Journael', fol. 225v. lines 9-14

Te vernemen of men van deselffde cleij niet wel beter steen can baecken als men wel op past. Soude men clinkaert niet rechts connen backen? Soude klinckaert niet goet sijn in gevels? Backt men classiorens? Soude men geen moppen konnen backen van 16 duym lanck, 8 breed, 4 dick? om muiren van een steen dick te maken.

Isaac Beeckman, 'Journael', fol. 226v. lines 29-31 lines 32-33

Steen hoedanigh [in the margin]

Huysen van backsteen syn beter als ander tegen den brandt; sy en springen niet in stucken als int vier gemaectt synde

Isaac Beeckman, 'Journael', fol. 227r. lines 1-3

Ick soude voor goet verstaen backsteen soo groot ende swaer maecken als een man bequamelick verleggen conde, als van 50 of 60 pont, want het soude stercker werck sijn.

Isaac Beeckman, 'Journael', fol. 227r. lines 4-7

Bentemersteen is de beste, daerna Walschbrabants wit arduyn, daerna levendel; maer perpensteen is de slechtste soorte, doch is bequam om in de gront te leggen van sware gestichten, want het wast binnen 9 of 10 jaren aen malcander.

## Various notes

# Various notes about masonry, carpentry, forging and smoke

### ON MASONRY

#### *On bricks, stones and tiles*

Isaac Beeckman, 'Journael', fol. 227r. lines 19-21

Bricks must be made from good properly kneaded clay.  
Clinker cannot be cut but it can be shaped.

Isaac Beeckman, 'Journael', fol. 225v. lines 9-14

To find out whether with the same clay one cannot bake better bricks if one is careful. Should one not be able to bake clinker directly? Would clinker be good in façades? Can closers be baked? Should one not be able to bake Roman bricks 16 inches long, 8 wide, 4 thick to make walls that are one brick thick.

Isaac Beeckman, 'Journael', fol. 226v. lines 29-31 lines 32-33

Brick, quality of [in the margin]

Houses made of brick are better against fire than others; they do not burst into pieces if they are made in the fire.

Isaac Beeckman, 'Journael', fol. 227r. lines 1-3

By good I mean making bricks as large and heavy as a man could conveniently move, 50 or 60 pounds for instance, because the work would be stronger.

Isaac Beeckman, 'Journael', fol. 227r. lines 4-7

Bentheim sandstone is the best, and then Walloon Brabant white limestone, and then lavender; but parpen ashlar is the worst sort, even so it is suitable for foundations for large buildings because within 9 or 10 years it grows together.



*Van calckmortel en trast*

Isaac Beeckman, 'Journael', fol. 225v. lines 15-17

Daer is moortel van oude wercken harder dan haer steen, sulcx datse staende blijft ende den steen diep uitgevrosen is in forme als wafels.

Isaac Beeckman, 'Journael', fol. 225v. line 32 - fol. 226v. line 2

Tras legghen [in the margin]

Om kelders in tarrast te leggen, men leght eerst sandt daerna een bedde van calck, daerop legt men dropsteen in tarrast, seven steenen hoogh, ende onder-tusschen viermael overal met tarrast.

Tarrast versteent wel int water alst niet geduerich door en loopt, in ses weken; buijten t'water in veerthien dagen.

Isaac Beeckman, 'Journael', fol. 226v. lines 10-17

Moortel [in the margin]

Een droppel sweets is beter in de [in de]<sup>116</sup> moortel dan een eemer waters. Nochtans als men t'moortel te veel bearbeyt, soo wortse waterachtiger dan mense verarbeyden can. Wat raet? Men sal beginnen de moortel te maecken een maendt eer mense besight, mengende calck, sandt en water naer behooren, en sooveel als men van doen sal hebben, ende daernaer alle dagen eens omwercken, hiermede drooght het water uut ende wort gesmij ende vet.

Isaac Beeckman, 'Journael', fol. 226v. lines 24-28

Spleten te stoppen in tarrast [in the margin]

Om te stoppen een splete in tarrast, daer water door comt, men sal nemen een deel roomenij, dat mael sooveel ongeblust, ende cappelingh van boter-melck, dat men van boven met een lepel van de melck sal scheppen alsoe begint te sien, ende maken daerof een pap.

Isaac Beeckman, 'Journael', fol. 226v. lines 29-31

Ik moet aen de metsers vragen oft niet goet en soude syn in de overwelfsels seer weijnich moortel te leggen om min te crimpen.

Isaac Beeckman, 'Journael', fol. 227. lines 14-18

Kalck hoedanich [in the margin]

Doornixe calck is de beste omdat het aen de steen harde vereenicht; daerna Maescalck, dewelcke gemaect wordt van blaeuwe ende witte arduyn. Maer

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<sup>116</sup> Here 'in de' is written twice, presumably by mistake.

*On lime mortar and trass*

Isaac Beekman, 'Journael', fol. 225v. lines 15-17

In old structures the mortar is harder than the brick, so that it remains intact while the bricks are deeply eroded like waffles.

Isaac Beekman, 'Journael', fol. 225v. line 32 - fol. 226v. line 2

Laying trass [in the margin]

Building cellars with trass, one first puts down sand and then a bed of lime, on top of that one puts down a trasslayer, seven stones high, and meanwhile four times all over with trass.

Trass becomes hard like stone in water, in six weeks, as long as it is not constantly running; out of water fourteen days

Isaac Beekman, 'Journael', fol. 226v. lines 10-17

Mortar [in the margin]

A drop of sweat is better in the mortar than a bucket of water. Moreover if one works the mortar too much, it becomes too watery to finish off. What advice? One should begin making the mortar a month before using it, mixing lime, sand and water in correct proportions, and as much as one needs for the work, and then turn it over once a day, this helps the water to dry and it becomes soft and fatty.

Isaac Beekman, 'Journael', fol. 226v. lines 24-28

Plugging cracks with trass [in the margin]

To plug a crack with trass, when water comes through it, take a part of cream, this time so much unslaked, and skimming the surface of buttermilk with a spoon when it begins to simmer, make a paste of it.

Isaac Beekman, 'Journael', fol. 226v. lines 29-31

I must ask the bricklayers if it would be good to use a very small quantity of mortar in the vaulting so it shrinks less.

Isaac Beekman, 'Journael', fol. 227. lines 14-18

Lime mortar, quality of [in the margin]

Tournai limestone is the best because it adheres firmly to the stone; then Maas limestone, which is made of blue and white freestone. But Leiden limestone being made of burnt shells, produces damp walls due to the salt.

Leydts calck, gemaect zynde van gebrande zeeschelpen, maeckt vochtige muyren om de souticheytswille.

*Van verbant der backsteenen en hartsteen*

*Van hooge sware metselrie*

Isaac Beeckman, 'Journael', fol. 226v. lines 18-23

Groote wercken metselen [in the margin]

Groote wercken moet men lancksamelijck opmaken, alsoo dat de onderste lagen drooghe sijn eermen daervan nieus wederom op werckt. Want de vochtigheyt van de bovenste kalck dringht door tot beneden ende houdtse soo week dat het sticht wel somtijts valt. Men weet dat de lage droogh genoegh is alsoe begint te schimmelen.

*Waerom nieuwe metselrie tegen oude gevrocht altijd bevonden wat te sincken en boemen dat voorkomen can*

Isaac Beeckman, 'Journael', fol. 227r. lines 8-13

Nieuw aen oudt gemetselt [in the margin]

Nieuwe mueren, aen oude gevrocht, worden altijd wat leeger, niet omdat de gront sijckct want de onderste jointuren kommen best overeen. maer omdat de mortel krimpt. Daerom sal men de moortel wel bearbeijden en dan daerop leggen ende groote steene maecken, of die aeneen maecken met gegoten loot in plaets van moortel.

*Van hechting van hout en steen*

Isaac Beeckman, 'Journael', fol. 195r.

Want al alleynskens styft, so krimpet gelyckelick, gelyck STEVYN schryft in syn pampieren van syn Boukonst van houdt ende kley, want kley, by het vier gedroocht, kryght boven spleten, omdatter veel vochticheyts uytgaende, de materia superficialis minder wort, niet konnende, gelyck te vooren al het binnenste begrypen. Also oock het hout, in de Sonne staende. Maer als kley ende houdt alleynskens noch drooghen, so krimpet al seffens, het binnenste vocht tyts genoegh hebbende om mede uyt te trecken.

Isaac Beeckman, 'Journael', fol. 227r. lines 22-28

Swaluwsteerten van houdt [in the margin]

Dewyle de steen is buyten ende het hout binnen, soo is de hechtighe van

*On bond with bricks and blue stone*

*On brickwork in lofty or massive buildings*

Isaac Beeckman, 'Journael', fol. 226v. lines 18-23

Building large works in brick [in the margin]

Large works should be built gradually, so that the lowest layers are dry before one puts something new on them. Because the dampness of the lowest layer of mortar penetrates downwards and keeps it so soft that the building sometimes even falls down. One knows that the layer is dry enough when it begins to produce mildew.

*Why new brickwork built on old brickwork always sinks a little and how one can prevent this*

Isaac Beeckman, 'Journael', fol. 227r. lines 8-13

New brickwork built on old [in the margin]

New walls, built on old ones, are always a bit lower, not because the ground sinks because the jointing underneath fits very well, but because the mortar shrinks. Therefore one should process the mortar thoroughly and then lay it and make large bricks, or else join them together with molten lead instead of mortar.

*On bonding wood and bricks*

Isaac Beeckman, 'Journael', fol. 195r.

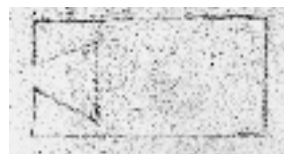
Because as it gradually grows hard, it shrinks at the same time, as Stevin writes in the papers for his Boukonst about wood and clay, because clay, when it is dried by fire, cracks on top, because with a great deal of moisture drying out, the surface material is reduced, not being able to contain all that is inside it all at once. The same is true of wood standing in the sun. But if clay and wood dry out gradually, it shrinks at the same time, the moisture within having time enough to depart.

Isaac Beeckman, 'Journael', fol. 227r.

lines 22-28

Dovetails in wood [in the margin]

While the brick is outside and the wood inside, it is necessary that they both adhere; it can also be done with stones that are carved open with wooden ends



ill. 53

beyde noodich; sal derhalven geschieden met sulcke ingehouwen steenen daerop houters passende die men heet geswaluwsteerte regels, genagelt aen de groote stylen ende steenen van boven, daeraen gedaen die neerwaerts schuivende. [ill. 53]

#### VAN TIMMERING

*Vande soorten van hout diemen in een landt gebruyckt als hier*

Isaac Beeckman, 'Journael', fol. 227r. lines 8-12

Esschenhoudt cleift wel en is goet tot spiessen ende diergelijcken. Elssen is bequam tot hooffden ende dyckdammen, maer niet tot timmeringe. Tot kammen ende staven gebruijckt men hardt hout, als bosboom, mispelboom, doornen, quernoellen. Huyphenhout is goet tot valgen van wielen; ten cleift niet.

*Vander timmerlien hupsche reetschappen die een seltsaem werck doen*

Isaac Beeckman, 'Journael', fol. 227r. line 29

Der timmerlieden beste instrumenten sijn sage, boor ende schave.

*Vande vervouging der corbelen en van stooven*

*Vant lassen der balcken*

Isaac Beeckman, 'Journael', fol. 230r. lines 33-35

De architraben of existilia, dat is opperbalcken, en bevallen my van steen niet, want steenwerck crijcht vasticheyt met bogen ende niet gelijk houdt.

*Waerom het dack van de sael inden Haeg so lange duert*

*Vande rusting der daken op de muerplaten en echting des selfs solders ande muerplaten*

#### OVERIGE NOTITITES

Isaac Beeckman, 'Journael', fol. 227r. lines 31-35

De cruyts van A en is niet goet, maer van B, omdat se aen twee malcanderen rakende syde is [ill. 54]

fitting into them that are called dovetailes nailed onto the large styles and stones above, placed on them and then sliding downwards. [ill. 53]

#### ON CARPENTRY

*On the sorts of wood that are used in a country such as ours*

Isaac Beeckman, 'Journael', fol. 227r. lines 8-12

Ash tree wood is easy to cleave and is good for spears and suchlike. Alder wood is good for piers and dams, but not for carpentry. For combs and staves one should use hard wood such as yew, medlar, hawthorn and [...].

Elm is good for the rims of wheels; it does not cleave.

*On beautiful tools of carpenters for doing superior work*

Isaac Beeckman, 'Journael', fol. 227r. line 29

A carpenter's best instruments are saws, drills and planes.

*On the disposition of curved braces and stoves*

*On welding joists*

Isaac Beeckman, 'Journael', fol. 230r. lines 33-35

Architraves or existilia, that is, upper joists, I do not care for them to be made of stone, because stone work becomes inflexible when it bends and does not support the weight evenly.

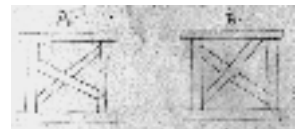
*Why the roof of the hall in The Hague lasts so long*

*On supporting roofs on the wall plates and tying attics to the wall plates*

#### OTHER NOTES

Isaac Beeckman, 'Journael', fol. 227r. lines 31-35

Cross A is not good, but B is, because it is fixed to two juxtaposed sides [ill. 54]



ill. 54

Isaac Beeckman, 'Journael', fol. 227v. lines 3-7

Preserving wood [in the margin]

Isaac Beeckman, 'Journael', fol. 227v. lines 3-7

Houdt goet houden [in the margin]

Tegent splijten van houdt bestrijckt ment vuijle olij ende smeer; men legget buyten de son en wint, niet op malcanderen; men begravet in het sandt. Het houdt wordt oock van de kalck opgegeten. Daertegen beperckt men sooverre, of men legget in een gehouwen steen. In drooge moortel ist beter dan in natte.

Isaac Beeckman, 'Journael', fol. 23or. lines 22-23

Veel hout aen een huys is goet, want het stijfft geweldich alst slechts uut de regen ende wint staet.

Isaac Beeckman, 'Journael', fol. 23or. lines 24-29

Houdt waerom het splijdt [in the margin]

Het hout splijt van de sonneschyn, gelijk het kley voort vier, om het haestich uitgaen van de vochticheyt uut het uuterste; soo wort het uutertse minder ende en kan het binnenste niet vatten. Daerom spleijt het. Maer buyten sonnenschijn drooget van binnen en van bujten samen. Daerom leyden de Egijptenaers het nieu gehouwen hout een jaer lanck onder het sandt.

Isaac Beeckman, 'Journael', fol. 23or. lines 30-32

Glacies minus est sua aqua? [in the margin]

Alle verkouwende wateren vercleijnen, ende daerom is het vervrosen water cleynder dan doet vlietich was, waerdoor glasen &c. met water omstucken breken in de vorst.

#### VAN YSERWERCK EN VAN SMEDINGH

Isaac Beeckman, 'Journael', fol. 227v. lines 13-18

Yser wellen. [in the margin]

Wellen is yser aen yser smeden. het moet heet genoegh sijn, twelck men merckt aen seecker blaewicheyt; anders en hecht het niet, maer al te heet verbrandt het en wordt broos en bedorven.

Spaensch yser is het tayste ende beste, doch ondict ende niet suyver, Naems yser is het suiijverste om te vijlen, maer anders het brooste. Hierlandts is beter, oock beter dan Sweets.

#### VAN ROOCK

Van Schoorstenen, te weten om die te veroirdenen datse wel roock trecken.

H. Stevin, *Materiae Politicae*, Byvough der Stedenoirdening, pp. 75-83

To prevent wood from splitting one should smear it with dirty oil and tallow; one should set it out of the sun and wind, not in a pile; one should bury it in the sand. Wood is also eaten into by lime. To prevent this, one limits the contact as much as possible, or one sets it in a hewn stone. It is better in dry mortar than in wet.

Isaac Beekman, 'Journael', fol. 23or. lines 22-23

Much wood in a house is good because it becomes marvellously firm as long as it stands out of the rain and wind.

Isaac Beekman, 'Journael', fol. 23or. lines 24-29

Wood, why it splits [in the margin]

Wood splits because of sunshine, just as clay does before fire, because of the speedy loss of moisture through the surface; the outside thus becomes smaller and cannot contain what is inside. Therefore it splits. But out of the sun it dries inside and outside at the same time. Therefore the Egyptians leave newly chopped wood for a year under the sand.

Isaac Beekman, 'Journael', fol. 23or. lines 30-32

Glacies minus est sua aqua? [in the margin]

All cooling waters cause shrinking, and therefore frozen water is smaller than if it was flowing, so that glasses etc. with water in them break in pieces in the frost.

#### ON IRONWORK AND FORGING

Isaac Beekman, 'Journael', fol. 227v. lines 13-18

Welding iron [in the margin]

Welding means forging iron with iron. It must be hot enough, which one can see from a certain blueness: otherwise it does not adhere, but if it is too hot it burns and is brittle and spoils.

Spanish iron is the toughest and the best, but it is not firm enough nor is it pure, Namur iron is the purest for filing, but it is also the most brittle. Here in our country it is better, also better than Swedish.

#### ON SMOKE

On chimneys, to know how to plan them so that they draw smoke.

H. Stevin, *Materiae Politicae*, Byvough der Stedenoidening, pp. 75-83



De schoorstenen sijn oock een deel, onder de voornamelickste saken, daermen in den huysbou sorchvuldelick acht op nemen, overmits de bekende swaricheden, commende vande gene die niet wel roock en trecken.

Om nu na den eysch vandien totte saeck te commen, hebbe daer toe veroirdent, dit 8 Hoofdstick , int selve sullen wy eerst segghen vande spiegelingh deser stof; Daer na van verscheyden ghebruyckte voorbeelden.

Ten derden en laetsten van onse manier.

#### 1. Punt vande Spieghelingh des roocz.

De roock die inde schoorsteen haer behoorlicke ganck niet en heeft, wort verhindert van beneden of van boven van alle beyde: Van beneden, als wanneer vanden heert ghedreven wordt eerse inde buyse gheraectt, met wint commende deur veinsters, deuren, spleten of ander openheden, De verhindernis van boven ghebeurt, wanneer de wint van boven neerwaert vallende, stercker dan de tocht des roocz van onder opwaert is, de selve weder te rugghe doet keeren, en het Huys vervullen. Belanghende de beteringh des ghebrecx van beneden, gemerckt datmen 't selve ghemeenlick sien en helpen can, mette gaten ofte openheden daer de wint deur comt, dicht toe te sluyten, en dat daerbeneven de verscheyden ghestaltenissen vande omstaende openheden sonder eynde sijn, so en willen wy niet trachten na eenighe ghemeene reghel daer af te beschrijven; Achten de datmen 't begheerde heeft, wanneer alle deuren veinsters en ander lochtgaten toe sijnde, de camer al dan sonder roock blijft; ja alwaert dattet roockte deur openstellen van deuren of veinsters, ghemerckt die ghemaect sijn om te sluyten. Maer de verhindernis alleenelick van boven commende, welcke men ghewaer wort wanneer de roock, van selfs gheneycht sijnde opwaert na de buyse te trecken, sonder beneden hindernis te krijghen, nochtans inde buyse al gheweest hebbende, weerom buyten de mantel keert, en de camer vervult, daer af is ons voornemen, middel te verclaren om sulcx te beletten.

Men siet ande roockende schoorstenen, voornamelick die tusschen hooger huysen staen, dat de roock nu na d'een sijde, dan na d'ander keert, d'een ooghenblick recht neerwaert, d'ander weer om hooch, 't welck ons sekerheyt gheeft, dat die onsienelicke winden self sulcken onseker roersel moeten hebben, ende dat na de afkeeringhen diese op de schuttende saken krijghen, ende na de cracht diese daer op doen, d'een ooghenblick stercker of crancker als d'ander; want waer de ghewelt uyt een selve oirt wajende eenvaerdelick de selfde, de reden wil dat de wint teghen een schoorsteen oock eenvaerdelick de selve loop soude houden, dat is gheduerlick opwaert of neerwaert, of sijdelingh, soot dan waer. 't Is oock te weten dat alle wint, commende uyt eenich gat, neemt van daer voort een loop (ghelijck oock 't water doet) na

Chimneys also form part, of the most important matters, that one should pay careful heed to in building houses, with the well- known inconveniences, deriving from those where the smoke does not draw properly.

To come now to the matter of their requirements, we have disposed, this 8th Chapter,<sup>102</sup> in it we will first speak of the different theories on this matter; Afterwards of different examples that have been used. Thirdly and lastly of our own method.

First point: On the Theory of smoke.

The smoke in chimneys that does not have its proper passage, is hindered from below or from above or from both: from below, when it is driven from the fireplace before having first entered the flue, with wind blowing through the windows, doors, cracks or other open places, A hindrance from above occurs, when the wind blowing downwards, is stronger than is the upward draught of smoke from below, that forces it to return, and fill the house. Concerning the improvement of the faults from below, it should be observed that generally one can see and help the same, by closing up the holes or openings that the wind comes through, and that furthermore the different shapes of the surrounding openings being endless, we will not try and deduce a single general rule for them; presuming that one wanted this, when all the doors and windows and other air holes being closed, the room then will remain without any smoke; this is true if the smoke only came through the openings of doors or windows, seeing that these are designed to be closed. But the hindrance only coming from above, such as one observes when the smoke, that of itself tends to be drawn upwards into the flue, without creating a nuisance below, yet having already been in the flue, returns outside the mantel again, and fills the room, our intention here is to explain a method for preventing such a thing happening.

One can see from smoking chimneys, especially those that stand between higher houses, that the smoke now blows to one side and then to the other, one moment going straight down, the next upwards once more, which shows us clearly, that the invisible winds must themselves have such an uncertain movement, and that with the rebuff they get from things that give shelter, and the force they inflict on them, they are stronger or more terrifying one moment than another; because when the violence blows constantly from the same direction, it is reasonable to suppose that the wind will always take the same direction against a chimney, that is constantly upwards or downwards,

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<sup>102</sup> Hendrick Stevin is alluding to his own *Byvough*.

gheleghentheydt der form vant uysterste des selfden gats; als by ghelijckenis, wannermen blaest deur een omghecromde trompethoorn, met twee of drie keeren, hoewel de gheblasen wint daer in verscheyden loopen heeft nu voorwaert dan achterwaert, nochtans uytcommende vliecht dien wech heenen, daer de uysterste cant die heenen wijst.

Nu dan de verscheydenheden der winden dusdanich wesende, soo is te weten dat al de gheene die van buyten langs de schoorsteen opwaert trecken, den roock gheen verhindernis en doen maer die van boven inde buyse neerwaert commen, jaghen den roock daer uyt inde camer: Teghen sulcke dalende winden moetmen voorsien en de rysende tot bate nemen: Maer hoemen 't selve op verscheyden wijsen dadelick te werck gestelt heeft, sullen wy nu verhalen, metsgaders de redenen waerom sulcx tot sommige plaetsen helpt tot ander niet, ja tot ettelicke verergert. Daer na sullen wy van onse manier segghen.

2 Punt. Vande verscheyden middelen diemen tot elcke plaetsen ghebruyckt.

Sommighe veroirdenen op ronde schoorsteenbuysen, om schoorsteen wel roock te doen trecken, een schutsel van Form als een vierclock, ghelijck hier nevens, te weten met een wintvaen, die de selve clock, (drajende op een pinne) met de rugghe na den wint doet keeren. [ill. 55]

Nu hoewel dese manier eenig schijnsel van reden heeft, waer deurmen soude menen, dat de wint van allen oirten 't sy Noort, Oost, Zuyt of West gheschut wordt, datse inde schoorsteen niet gheraken en can, nochtans leert d'ervaringh sulcx tot sommige plaetsen en tijden niet te helpen, maer dickwils achterdeel te doen: De oirsaeck daer af can dusdanigh wesen: Ten eersten so en mach dat niet helpen teghen winden, die inde spieghelingh des eersten punts gheseydt syn van boven neerwaert te commen: Ten anderen al waer de schoorsteenbuyse soo hooch boven de nevenstaende ghestichten of gheberchten, datter niet dan sighteyndersche<sup>117</sup> wint an en quam, nochtans cant ghebeuren de wint soo slap te wesen, datse de clocke niet keeren en can, maer wel de macht heeft om de roock weerom neder te drijven: Indervougen dat de clocke, blyvende mette opensijde na de wint toe staende, doet veel meer achterdeel dan voordeel, want ghelijck haer rugghe den wint afwijst, alsoo ontfanght de holle sijde meer wints, dan offer gheen clock en waer. Ander schoorsteenen hebben een overdecksel in form bycans van halfront als hier nevens, waer me de winden van boven rechtneerslaende, eenichsins afghekeert worden; schut oock reghen, haghel en sne, datse inden heert niet en vallen: Maer winden die van

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<sup>117</sup> In the margin: 'Horisontalis'

or sideways, if that is where it comes from. It should also be known that all wind coming out of some hole, takes a course (just as water does) according to the shape of the exterior of the same holes; as for instance, when one blows through a curved trumpet two or three times, although the wind blown into it takes different directions now forward and now backwards, yet coming out it blows away, in the direction indicated by the outward side.

Now the variations of winds being such, so it should be known that all that which blows upwards past the outside of the chimney, is no hindrance for the smoke but that from above which comes downward into the flue, drives the smoke out of it into the room: one should therefore take precautions against descending winds and be thankful for rising winds: But we will now tell, how people have acted with different methods to deal with the same problem, together with the reasons why they help in some places and not in others, indeed many times making matters worse. After that we will speak of our own method.

Second point: On the different means that are used in each place.

Some peoples place a protective piece in the shape of a weathercock, like the one in the illustration opposite, on top of round flues, so that the chimney can draw the smoke, with a weather vane namely, that makes the same weathercock (revolving on a pin) turn with its back towards the wind. [ill. 55]

Now although this method has some semblance of reason, by which one would think, that the wind would be repelled from every direction whether north, east, south or west, preventing it from blowing into the chimney, even so experience tells one that in some places and times such a device cannot help, but is often actually harmful: the cause of this is as follows: firstly it cannot protect against winds that as said in the first point of the theory blow downwards from above: secondly even if the chimney stack is so high above the neighbouring buildings or mountains, that only a horizontal wind can enter it, even so it may be that the wind is so weak that the weathercock does not revolve, but still has the power to drive the smoke back again: in instances where the weathercock, remains with its open side pointing towards the wind, it does much more harm than good, because just as its back repels the wind, so the hollow side receives more wind, than there would be without a weathercock at all. Other chimneys have a cap perhaps in the form of a semicircle as in the adjoining figure, by which winds blowing straight downwards from above, can to some extent be repelled; it



ill. 55

ter sijden int gat commen, 't can ghebeuren datse teghen 't selve [ill. 56] deksel een weer slach krijghen en overvloedelicker inde buyse keerden danse soude, sonder dat deksel. Sommige stellen voor de boveschreve gaten twee barders vande selve form welcke sy schilden noemen, die vast ghemaect sijn an vier yzers, also datter tusschen beyden ontrent drie duym open blijft: Dese schilden schutten wel de wint die recht op de gaten comt, maer sijdelinsche winden connen daer teghen een weerslach krijgen, en den roock overvloedelicker inde pijp doen keeren; alsoo datmender somwijlen bate andermael achterdeel by merckt.

Over ettelicke pijpen wert een coker ghestelt, als hier nevens, onder open, boven met een gat ontrent soo groot als 't gat der pijpen, de [ill. 57] selve doen tot sommige plaetsen goeden dienst; Ander heb ick ghesien die met seker winden niet veel en hielpen; Doch wil de reden datse eenich voordeel gheven, want sichteindersche winden en connen niet lichtelick schaden. Angaende de neervallende, welcke deur 't bovenste gat der coker commen de selve verscheyden terstont, deur dien dat de coker onder wijder is; Daerom comter ontrent soo veel keerende wint min inde buyse, dant sonder coker doen soude, alsser ter sijde de buyse wint valt: Maer als beneven dit voordeel deur 't gat der buyse, noch soo veel wint gheraect datse den tocht des roocx overwint, soo moet den roock inde camer keeren.

Leo Baptista Albertus int 17 Hooftstick sijns 5 boecx, raet de schoorsteen boven toe te decken, en daer an te maken neerwaert [ill. 58] streckende neusgaten als hier nevens: 't Selve is wel goet teghen sne en reghen, oock teghen alle neerstaende winden, maer de sichteindersche<sup>118</sup> en rijsende deur 't een neusgat daer in commende, en vliegghen niet recht deur een ander neusgat weerom daer uyt, dan connen van binnen tegen het deksel een weerslach krijghen, diese door de meeste ruymte na den heert doet keeren.

Cardanus lib: de subtilitate 2, wilt inde schoorsteenpijpen ghestelt hebben niet alleen sulcke vier neerwaert streckende neusgaten als boven, [ill. 59] maer noch vier daer toe opwaert streckende, als hier nevens; Dese laetste vier en connen deur ghemeene reghel gheen deucht doen, want als neerslaende ende sichteindersche winden daer in commende, sijn gheneycht den roock na den heert te jaghen.

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<sup>118</sup> In the margin: 'Horisontalis'.

protects also against rain, hail and snow, so that they do not fall in the fireplace: but winds that blow into the hole from the side, it can happen that [ill. 56] they are repelled by the same cap and go back down the chimney with more force than they would, without the cap. Some people suggest for the said holes two planks of the shape that they call shields, that are fixed to four pieces of iron, so that between them both there remains a space of three inches open: these shields do protect against the wind that comes directly on it from above, but winds from the side may be repelled by it and blow the smoke with even more force back into the chimney; so that one sometimes sees advantage in it and other occasions harm.

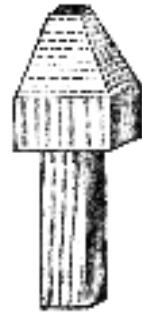
Over many chimney flues a cylinder is placed, as in the adjoining figure, open underneath, and above with a hole about as large as the holes of the flues, the [ill. 57] same do good service in some places; another I have seen that with certain winds does not help very much: but the reason for them is that they do some good, because horizontal winds cannot easily do harm. Concerning downward blowing winds, that come through the top hole of the cylinder, it is immediately different due to the fact that the cylinder is wider underneath; Therefore so much wind less is blown back into the chimney, as would occur without the cylinder, as there is wind falling to the side of the chimney: but if besides this advantage so much wind can still blow through the hole in the flue that it drives back the movement of the smoke, then that smoke must return to the room.

In the seventeenth chapter of his fifth book, Leon Battista Alberti recommends [ill. 58] that the chimney should be covered above, and then to make large nostrils in it as in the adjoining figure: the same is good against snow and rain, also against all winds blowing from above, horizontal and upward-blowing winds enter it, rising through one nostril, without flying directly out again through another nostril, then they can be repelled inside by the cap, that makes it return to the fireplace through the largest space.

Cardanus lib: de subtilitate 2, prefers that the chimney flues contain not only four downward facing nostrils as above; [ill. 59] but four others facing upwards as well, as in the adjoining figure; the four latter ones cannot do any



ill. 56



ill. 57



ill. 58



ill. 59

Sommighe maken een viercante overdeckte schoorsteen buyse, daer an vervoughende (als hier nevens) noch twee corte buyskens die [ill. 60] beyde overdeckt sijn na de manier der voorgaende 2 form, waer in den roock deur een sijdgat comt. Ende ghelijck hier dese twee buyskens anghestelt sijn, alsoo wordender oock ettelicke schoorsteenen op alle vier de sijden ghebrocht, welke tot sommighe plaetsen helpen, tot ettelicke niet.

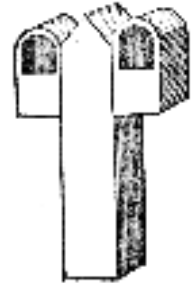
Ander worden altemet geholpen met een deure, veinster of ander locht gat open te stellen: d'Oirsaeck der verbeteringe, is dat de wint door de selve commende, bygevalle recht deur de schoorsteen uytvliecht, sonder den roock buyten de mantel te slaen, overwinnende alsoo alle vallende winden. Maer sulcke manier en is niet seer te prysen, overmits de camers diemen Winterdaechs warm begeert, daer deur seer vercouden; Ten anderen nadien deuren aen camers gemaect syn om te sluyten, en die te bevryden, datmen van buyten niet en siet, watmen daer binnen doet, soo ist een ongerief tegen syn wille in open camers te moeten sitten. Daerom een schoorsteen soo geholpen zijnde, datter met gesloten deuren en veinsters geen roock inde camer en komme, het schynt an dit voornemen genoeg gedaen, ja al waren sy oock met open deuren en veinsters seer roockende.

't Gebeurt oock altemet dat den roock geholpen wort met de schoorsteen af te breecken en weerom een ander te maken, sonder datmen mercken can, waerom dat de verbeteringh geschiet: maer die hier af syn verwondering wil verminderen, dencke eens hoe dat sommige personen blasende int gaetken van een duytsche pype, en connen wat sy oock blasen, de pype geen geluyt doen geven, niet tegenstaende sy haer mondt daer an setten en daer in zydelingh blasen, gelijck ander diese doen fluyten; nochtans by aldien de windt uyt haer mondt daer in quam, even eens sonder eenich verschil, gelijck van d'ander, sy soude daer in dergelijcke daet moeten wercken; waer uyt te verstaen is, dat een seer cleene verandering der form, lichtelick oirsaeck can wesen, om de sichteindersche winden meer of min inde buyse te doen vaten.

Sommige maken de schoorsteenbuyse met een dickhooft ant einde daer de roock uytcomt, gelijck de nevenstaende voorste buyse: ander ter [ill. 61] contrarie, boven ten dunsten met manier van afdaking gelijc de achterste buyse, welke wyse my ooc best bevalt, om dat die schoensheyt de schadelicke winden beter afwyst.

good as a general rule, because if downward-blowing winds and horizontal winds enter them, they tend to drive the smoke back down into the fireplace.

Some people make a square cap for the chimney flue, adding (as in the adjoining figure) two extra small short flues that [ill. 60] are both covered in the manner of the preceding second figure, in which the smoke comes through a side hole. And just as these two pipes are placed here, so also many chimneys are attached on all four sides, which in some places help but in many others do not.

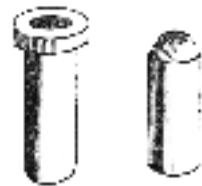


ill. 60

Others are sometimes helped by opening a door, window or other vent: the cause of the improvement, is that the wind blowing through the same, sometimes blows straight out through the chimney, without driving the smoke outside the mantel, all falling winds are thus vanquished. But this method is not to be esteemed too highly, since the rooms that one wants warm on days in winter, become quite cold as a result; secondly seeing that doors are made in rooms to be able to close them, and to give them shelter, so that one cannot see from outside what is going on inside, so it is an inconvenience to have to sit against one's will in open rooms. Therefore if a chimney is so protected that even with closed doors and windows no smoke can come into the room, it seems that enough is done to this end, yes even if they were also very smoky with the doors and windows open.

It also often happens that the smoke is got rid of by demolishing the chimney and building another, without it being clear why that improvement occurs: but one might be less astonished at this, by thinking how some people when they blow into the hole of a German pipe, however much they blow, they cannot make the pipe produce any sound, even though they put their mouth to it and blow on it sideways, just as others do and succeed in producing a sound; yet if someone else's breath was blown into it from his mouth, without any difference, just as the other person did, they would well succeed in doing it; from which it can be concluded, that a very small change in shape, may easily be the cause, that horizontal winds enter the flue to a greater or less extent.

Some people make a chimney with a thick cap at the end where the smoke blows out, similar to the first flue opposite: others do the [ill. 61] contrary, put a thinner one on top with a cap that is similar to the second flue, this being the manner of protection that I prefer, because the bevelled side is more effective in repelling harmful winds.



ill. 61



According to a note by Hendrick Stevin, there was another passage here, with his father's arguments for preferring the chimney with a circular flue (with a bevelled top) to the square variety. He also added a variant of his own with a double bevelled top. The illustration hereof that Hendrick Stevin in his fathers' text is omitted here.

De schoorsteenen meynen sommige, hebben in Hollandt meer gebreck vanden roock dan in ander Landen, de reden zijn daer af verscheyden. Ten eersten en heeftmen inde stoven geen gebreck van roock, om dat sy daer met geweld gedrongen wort ter pype uyt te vliegen. Ten tweeden men brant nergent meer turf dan in Hollandt, die meerder roockt dan hout. Ten derden is 't gerucht daer meerder, om dat de Vrouwen daer eygensinnelicker zijn op witte meuren dan elders.

Ick hebbe gesien dattet roocken gebetert wiert, met wat waters te gieten op den heert rontom het vier, maer 't selve water uytgedroocht zijnde, soo begon det weerom te roocken; dit heb ick tot sommige plaetsen sien helpen, tot ander niet, oirsaeck der hulp mach vermoet worden *ex Eolipila*.

Ick hebt oock sien helpen met een rechte stock over 't vier inde schoorsteen te steecken.

't Gaet mette roock gelijk met een waech, liggende in d'een schael 100 lb in d'ander 99 een once daer toe en beweecht niet noch twe noch drie oncen, &c. maer meer dan hondert pont daer incommende, die schael daelt neer: alsoo gebeuret dat den roock van onder (soo te seggen) meer dan een pont hulps moet hebben, daerom 1. 2. 3. 4. of 5 oncen, daer by geleyt zijnde, men segt ten helpt niet, nochtans helpt alsoo verre alst streckt.

According to a note by Hendrick Stevin, there was another passage here, with his father's arguments for preferring the chimney with a circular flue (with a bevelled top) to the square variety. He also added a variant of his own with a double bevelled top.<sup>103</sup>

The chimneys, in Holland, according to some people have more problems with smoke than is the case in other countries, the reasons for this are various.<sup>104</sup> First of all in the warm rooms one has no problem with smoke, because there it is driven out with great force through the flues. Secondly nowhere is more peat burned than in Holland, this producing more smoke than wood does. Thirdly more fuss is made there, because the women there are more insistent on white walls than elsewhere.

I have observed that smoke is improved, by pouring some water in the fireplace around the fire, but once this water has dried up, it starts giving off smoke all over again; I have seen that this helps in some places, but in others not, the reason for this help can be presumed to be *ex Eolipila*.

I have also seen that a straight stick being pushed up the chimney above the fire can help.

It is the same with smoke as with a weight, with 100 lb in one scale and 99 in the other add one ounce and it does not move nor do two nor three ounces, etc, but when more than a hundred pounds is in it, the scale will descend: so it happens that the smoke from underneath (in a manner of speaking) must have the help of more than one pound, therefore 1. 2. 3. 4. or 5 ounces being placed there, one says that it does not help, although it does help to that extent.

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<sup>103</sup> See appendix E, Notes on the unfinished *Huysbou*, p. 495 Hendrick Stevin, *Materiae Politicae, Byvough der Stedenoidening*, Hoostick 8, p. 82. The illustration of this chimney with double bevelled top that Hendrick Stevin inserted in his father's text is omitted here.

<sup>104</sup> Cf. for this passage Isaac Beeckman's commentary, 'Journael', fo. 227v. lines 19-27

# Aenteijckeninghen op Serlijns en anderen / Inhoudende sommige geschillen

[I] GESCHIL OP MATEN DER PILAREN MET HAER AENCLEIVING

Op maten der pilaren met haer ancleving.

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 107-110

De Boumeesters en commen niet over een, aengaende de maten der pilaren met datter toebehoort tot cieraet streckende, waer af ettelicke achten, datmen de beschreven regelen van Vitruvius volcommelick moet volgen, sonder daer af te weycken; Ander en willen hun daer an niet verbinden. Ick overleggende me en tegen<sup>119</sup> van dit geschil, heb my de meyning der laeste, best laten bevallen, uyt oirsaeck dat geen ander regelen, alleman int ghemeen en connen verbinden, dan die uytter natuer of om nootsakelick reden gemeen zijn: Als by gelijckenis dat Vitruvius met sijn navolgers, voor schilders en beeltsnyders regelen beschryven, vande everedenheyt<sup>120</sup> dieder bestaet inde leden van menschen lichamen, ygelick verstaet dattet billich is soodanige, als mette natuer overeencommende, voor gemene regelen te houden: Maer datmen verscheyden afcomsten<sup>121</sup> van pilaren bedenckt, als mannelicke,<sup>122</sup> diens langde haer dichte sesmael begrypt, om dat de man ses sijner voeten lanck is: Ende een Vrouwelicke,<sup>123</sup> die haer dichte achtmael vervangt, om dat de Vrouwe rancker is dan de man, haer gevende een tegel<sup>124</sup> beteyckenende een schoe, ende ant hoofd twe slangtrecken als wrongen in plaets van gecrult haer, oock Voren<sup>125</sup> die de ploien der Vrouwen klederen bedien: Voort dat de nacomelingen die dese saecke noch diepsinnelicker overleyden, de boveschreven maten verlangde, gevende de hoochde vande mannelicke seven dickten, vande vrouwelicke acht en een half: Dat hier na noch verciert wert een Maeghdelicke<sup>126</sup> pilaer,

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<sup>119</sup> In the margin: 'Pro & contra'.

<sup>120</sup> In the margin: 'Proportione'.

<sup>121</sup> In the margin: 'Species'.

<sup>122</sup> In the margin: 'Virilis ut Dorica'.

<sup>123</sup> In the margin: 'Muliebris nempe jonica'.

<sup>124</sup> In the margin: 'Plinthum laterculum, orliem, soccum'.

<sup>125</sup> In the margin: 'Strias'.

<sup>126</sup> In the margin: 'Virginalis quemadmodum Corinthia'.

# Notes on Serlio and others / Concerning some discourses

## I. DISCOURSE ON THE MEASUREMENTS OF COLUMNS AND ALL THAT APPERTAINS TO IT

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 107-110

Architects fail to agree, concerning the measurements of columns and the ornament that pertains to them, with many people deeming, that one should follow the rules written down by Vitruvius in their entirety, without deviating from them; others do not want to be tied down by them. I myself considering the pros and cons of this discourse, have preferred the latter opinion, because no other rules can bind everyone in general, except those that come from nature or from necessary causes: for instance, Vitruvius and his followers, prescribe rules for painters and sculptors, on the proportions that exist in the members of human bodies, everyone understands that it is reasonable to take this as a general rule, as being in accord with nature: but that one devises various orders for columns, as a male one, the length of which is six times its width, because man is six times the length of his feet: and a female, that is eight times its width because woman is more unstable than man, giving her a tile representing a shoe and two serpentine volutes instead of curly locks, also furrows that represent the folds in women's clothes: further that posterity that gave deeper thought to this matter, made the said measurements even longer, giving the height of the male as seven times the thickness, of the female eight and a half: that still later a virginal column was devised, more delicate, longer

teerder, lanckworpiger en cierlicker als d'ander, diens hoofd in deser vougen soude gevonden wesen: Alsooder een Corintische Maecht overleden was, haer Voester leyde seecker drinckvaten, die in heur leven haer angenaem geweest hadden, in een mande, stelde die opt hoogste vant graft, en op datse langer onder den blooten hemel gedueren soude, decktese met een tegel: De mande stont bygeval op een Beerclaenswortel,<sup>127</sup> welcke vant gewicht gedrukt zijnde, heeft haer bladeren en stelen uytgespreyt, wassende langs de cante der mande, ende vant gewicht der tegel niet voorder commende, waren gedrongen weerom neerwaert te keeren: Nu alsoo den Boumeester<sup>128</sup> Callimachus daer voor by rijdende dit sagh, de form beviel hem wel; Hy heeft na dat voorbeeld by de Corinthiers pilaren gemaect, ende de deelen seker maten gegeven, daer die afcomst<sup>129</sup> uyt bestaat: Voort alsoo int begin de pilaren van hout waren, die ande eynde yser of coper banden hadden, om vant gewicht, 't welck sy droegen, niet te splyten, dat daerom ande eynden der stene pilaren oock ringen oo seker bepaelde maten veroirdent worden: Alle dese en diergelijcke regelen mach elck diet belieft wel sorchvuldelick en volcommelick navolgen, maer dat hy soude achten ygelick daer an verbonden te wesen, voorwaer de vermaerde Boumeesters<sup>130</sup> die nu ter tijt contrari doen, en verstaen ick niet datmen met recht daerom begrypen can, gernerckt het boveschreve altemael seer eenvoudige redenen zijn, daer geen natuerlicke dwanck noch nootsakelick verbant in en bestaat: Ia dat de ouden selfs hun daer an niet tenemael verbonden en hebben, soot blijkt uyt de overblijfselen der ouden gestichten die te Rome en elders genoeg ghevonden worden: Het gaet hier me als mette form en cieraet der clederen, want gelijk wy soo weynich verbonden sijnde ande verzierde drachten, van ander Volcken, als syluyden ande onsen, alsoo oock mettet cieraet der pilaren, d'een is ande droomen van d'ander niet ghehouden, maer elck mach alle drie Vitruvius afcomsten<sup>131</sup> t'samen mengen, (gelijk oock dadelick ghebeurt inde ghemengde pilaren diemen composita noemt) daer af en toe doen, na dattet hem dunckt totte meeste verciering te strecken, ende daer hy alst noodich valt, de beste reden af can geven. Angaende de gewoonte, die Vitruvius int 2 Hooftstick sijns 1 boecx tot desen eynde oock verhaelt, seker sy is van grooter cracht, en niet t'onrecht, d'ander natuer ghenoeft; Doch machse in drie afcomsten onderscheyden worden, te weten volgelicke, schuwelicke en vrie: Volgelicke daermen hem na gevougen moet, als dat

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<sup>127</sup> Presumably Stevin means 'beerklauw' and there should therefore be a 'u' here and not a 'n'; in the margin: 'Acanthum'.

<sup>128</sup> In the margin: 'Architectus'.

<sup>129</sup> In the margin: 'Species'.

<sup>130</sup> In the margin: 'Architecti'.

<sup>131</sup> In the margin: 'Species'.

and more ornamental than the other, whose capital is supposed to have been discovered in this manner: once upon a time a Corinthian virgin died, her nurse laid some goblets, that had been dear to her when she was alive, in a basket, placed this on the top of the grave, covering them with a roof-tile, so that they might last longer, in the open air: the basket happened to be placed just above the root of an acanthus, which being pressed down by its weight, spread out its leaves and stalks, so that they grew round the sides of the basket and not being able to grow further due to the weight of the tile, were forced downwards once more: now when the architect Callimachus saw it as he was riding past, he was delighted by its shape; he has made columns for the Corinthians based on that model, and given the parts certain measurements, this being the origin of this order: further since the columns were at first made of wood, that had iron or copper bands at the ends, so that they would not split, from the weight they carried, rings of certain specific measurements were therefore also designed for the ends of the stone columns: anyone who approves of all these and other similar rules may follow them meticulously and completely, but that one should regard everyone bound by them, when renowned architects in the present day do the opposite, I do not understand that one can rightly interpret them so, seeing that the said reasons are all very simple reasons, containing no natural law or obligation of necessity.<sup>105</sup> Indeed the ancients themselves did not feel subjected to them as can be seen from the remains of ancient buildings in Rome and elsewhere: what is involved here is the same as with the shape and ornament of garments, because just as we are so little obliged to follow the ornament and attire, of other peoples, as they are of ours, it is also the case with the ornament of columns, one person is not bound by the dreams of the other, but everyone may now and then mix all three of Vitruvius' orders together (as also occurs in the mixed columns known as *composita*), when he thinks that this provides the finest ornament, and for which he can give convincing arguments, should that be necessary. As for the custom that Vitruvius tells of in the second chapter of his first book with regard to this, this is certainly of greater force, and not mistakenly, called second nature; But let them be divided into three orders, namely appropriate, careful and free. Appropriate being that which one must comply with, for instance that a man

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<sup>105</sup> Cf. for this passage Isaac Beeckman's commentary, 'Journael', fol. 225r. lines 18-28.

mans gecleet gaen na de gebruyck van mans, niet als vrouwen, want hoewel de natuer sulcken cleet voor de vrouwen niet eygentlick veroirdent en heeft, doch vereyscht de rede soodanige regel in een Lantschap onderhouden te worden, om de ongevallen te verhoeden die uytte contrari volgen. Schuwelicke daermen hem voor wachten moet, als de ghewoonte in een Lantschap gerocht sijnde van het droncken drincken een dagelicksche oeffening te wesen. Vrie daer af het doen en laten an yder vry staet, als sijn dranck te stellen in steene cruycken, of soo niet maer in tinnen kannen of glasen flesschen: Onder de laeste afcomst vervougen haer de maten der pilaren.

Dit genoegsaem 't gevoelen der voornaemste Boumeesters deses tijts wesende, oock mijn meyning, soo en heeft my niet noodich noch oirboir gedacht vande pilaren seker maten te beschryven, die inde natuer geen sekerhey en hebben, noch oock te bepalen<sup>132</sup> der deelen namen als

Torus, Stibas, rondosel, bacalus, bastone	Bedde	Abacus Denticulus	Disch Tandeken
Scotia, Cavetto, Scorza Contrabozel, Orbiculus, Trochilus	Groeve	Corona  Guttae, Clavi	Croon  Droppelen
Astragulus, Talus Tondino, Talon	Pickel.	Epistilium, Archithrabs	Opstyl.
Quadra, listello tillette	Lijste.	Temur. Canalis	Die. Gote
Annulus.	Rynck.	Sima, Gutta recta	keel.
Collum capitulorum, Apophygis	Hals.	Gymatium, Gula inversa.	krop.

En dierghelijcke, want elck bedenckt dagelicx nieuwe dingen, welcke alsoose int oneyndelick strecken, en niemant en verbinden, om die na te maken, geen seker bepaelde namen en behouven: Te meer dat hy die hem immers

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<sup>132</sup> In the margin: 'Definire'.

dresses as a man, not as a woman, because although nature has not actually disposed such attire for women, yet reason requires such a rule to be observed in a region, to protect against the misfortunes that result if the contrary happens. Cautious being that one should pay heed, whether the custom in a region being rumoured of drinking that drinking is a daily practice. Free being that everyone is free to do or not to do, if they want to put their drink in stone jars, or else in tin jugs or glass bottles: the measurements of columns belong in the last category.

This being more or less the feeling of the principal architects of these times, is also my opinion, and so I did not think it necessary or proper to state certain measurements for the columns, that in nature do not have any certainty, nor also to define the names of the parts as for instance

Torus, Stibas, rondosel, bacalus, bastone	Bedde	Abacus Denticulus	Disch Tandeken
Scotia, Cavetto, Scorza Contrabozel, Orbiculus, Trochilus	Groeve	Corona  Guttae, Clavi	Croon  Droppelen
Astragulus, Talus Tondino, Talon	Pickel.	Epistilium, Archithrabs	Opstyl.
Quadra, listello tillette	Lijste.	Temur. Canalis	Die. Gote
Annulus.	Rynck.	Sima, Gutta recta	keel.
Collum capitulorum, Apophygis	Hals.	Gymatium, Gula inversa.	krop.

And other similar names, because everyone invents new things every day, which nobody is bound to imitate since they grow ever more numerous, and do not therefore need any definite names: all the more since he who wants to



begeert te oeffenen, stof<sup>133</sup> genoeg vint (al leefden hy oock duysent jaren) die uyster natuer sekerheyt heeft, sonder syn tijt te verliesen, en hem selve te quellen met verzierde dwanck, welckemen beneven de reden oock metter daet bevint, soo wel voormael als nu, alleman niet te connen verbinden.

Maer alsoo hier geen beschryving der maten vande pylaren is, sommige sullen achten 't voornaemste deel der huysbouwing<sup>134</sup> daer in te gebreken, beschuldigende mijn onervarenheyt, als niet connende na maken 't geen veel ander voorgedaen hebben: Dan om de waerheyt te seggen, 't verdriet dat ick soude scheppen, in daer me besich te zijn, soude de vreucht overwegen, die ick vanden danck mocht verwachten; Want het overdencken vanden tijt die ick daer in voormael deur gebrocht hebbe, soude my noch wee doen, ten ware ick mijn selve toegave, daer deur geleert te hebben, dat de saeck in haer selve geen gront en heeft.

Doch om de begeerige tot sulcx eenichsins te grieveden, wy sullen hier eenige Schryvers verhalen, die der afghandelt hebben, te weten Vitruvius in syn 4 boeck; Leo Baptista Albertus in syn 7 boeck; Serlius in syn 4 boeck.

## 2. GESCHIL OPT GEBRUYCK DER PYLAREN TOT CIERAET

Opt gebruyck der pilaren tot cieraet.

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 111-112

Nadient gheviel dat de pilaren seer constich ghesneden wierden, en daerom de menschen behaechlick int gesicht waren: soo is daer uyt gevolght datmen die in alle gestichten seer gebruyckt heeft, niet alleen tot haer eygentlicke eynde, namelick van overwelfsels of daken te dragen, daermen tusschen de pilaren onder gaen mach, ghelijck daer af in haer bepaling breeder geseyt is, maer oock op plaetsen daerse niet noodich en waren, dan alleenlick tot cieraet, als datmense met menichte, d'een boven d'ander tegen de gemaecte gevels der huysen set, daermen niet tusschen en gaet, die oock dickwils niet en dragen, dat tot menschelick gebruyck noodich is aldaer gedragen te worden, maer selfs tot belasting der gevels strecken, alsoo datser niet genoeg an gehecht zijnde, daer af vallen, gelijk ettelicke Boumeesters den wercklyuden daer af schriftelick waerschouwen, en haer goetduncken verclaren om sulcx voor te commen.

Dit pilarich cieraet is van daer oock gerocht binnens huys, alwaer deuren, schoorsteenen, cassen, besteen en meer ander, gemaect worden met overvloedige menichte van pylaren d'een buyten d'ander uytstekende, hebbende haer waterlijsten, bochtlijsten en borstweeren, gelijk vooren vande gevels ge-

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<sup>133</sup> In the margin: 'Materiam'.

<sup>134</sup> In the margin: 'Architectura'.

practice them, will find enough material (even should he live a thousand years) that have certainty in nature, without wasting time, or tormenting himself with artificial constraints, that one discovers not just with one's reason but also in practice, both in former times and now, cannot lay an obligation on everybody.

But since there is no description of the measurements of columns here, some will consider the most important part of architecture to be absent, blaming my inexperience, for not being able to imitate that which many others have done before me: Then to tell the truth, the misery that I would cause, in occupying myself with this, would quite outweigh the thanks I could expect from it. Because thinking about the time that I previously spent on it, would still be painful for me, were it not that I admitted to myself, that I had learnt from it, that the matter in itself had no substance.

But to satisfy the curiosity of those who wish to know, we will tell of some writers, who have dealt with this, namely Vitruvius in his fourth book; Leon Battista Alberti in his seventh book; Serlio in his fourth book.

## 2. DISCOURSE ON THE USE OF COLUMNS FOR ORNAMENT

On the use of columns for ornament

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 111-112

After it came about that the columns were carved in a very artistic fashion, and were thus a pleasure for people to see: so it followed that they have been used very often in all buildings not only for their own purpose, namely as supports for vaults or roofs, so that one can walk underneath between the columns, as said in more detail when defining them, but also in places where they were not necessary, then solely for ornament, as one places many of them, one above the other against the façades of houses, so that people do not walk under them, and they do not support anything either, that is necessary for human use that something be supported there, but even tend to be a burden on the façades, in as much as if they are not attached firmly enough, they fall off, as many architects warn their workmen for in writing, declaring it to be their firm intention to prevent the same.

This ornament of columns is therefore also used in the interior, where doors, chimneys, cupboards, box beds and many other things, are made with an excessive number of columns one projecting beyond the other, with their drip courses, frontons and parapets, just as is said before about the façades and is said to have been made in imitation of antiquity: but because it does not rain in rooms, one does not need any drip courses.

seyt is, en geseyt worden na de antique gemaect te wesen: Maer wattet inde camers niet en regent, soo en sijnder geen waterlijsten noodich.

Nu dat sommige in sulck verciere met onbruyckbaer pilaren seer groot vermaeck scheppen, dat en canmen hemlien niet verbieden, maer dat sy de wercken die na sulcke haer pilarige invallen, niet verciert en zijn, voor gebreckig oirdeelen, ick laet my voorstaen dat haer oirdeel selfs gebreckich is. Ten anderen datmen de solders boven de voorsalen, die na 't schryven van Vitruvius, maer dertich voeten breed en zijn, om 't cieraets wille, met hinderlicke pylaren onderset, welcke over beyden sijden vleugels van vijf voeten maken, verminderende de ruymte die daer begeert wort; Dat mach syn bescheyt hebben, by de gene die inde moeyheyte der pylaren soo groot vermaeck hebben, datse liever sulck ongerief lyden, dan datse haer vernoegen missen, welcke ick daer in niet seer tegen wil zijn: Maer om hier benevens mijn gevoelen te verclaren; gemerckt dat de balcken lanck ende sterck genoeg wassen, om die solders, ja noch breeder, sonder onderstelling te laten, ick soude de cost, welcke ettelicke an die hinderlicke gesneden pylaren doen, liever besteden tot eenich ander verciering die geen belet en dede.

3. GESCHIL OP DICTE EN SWAERTE VAN PILAREN [missing]

4. GESCHIL OP ARCHITRAVEN [missing]

5. GESCHIL OP CLOCKEN

6. GESCHIL OP ACROTERIA OF PEDESTALEN

Summarised by H. Stevin under the heading *Geschil Op beeldich cieraet, op nitsen, en op Clocken, en op Acroteria of Pedestalen*. (Discourse about artistic ornament, in niches and on Frontons) H. Stevin, *Materiae Politicae, Byvough der Stedenoordening*, pp. 112-113

Wat lelicke monsters belangt, gemengt van menschen en beesten leden met ansichten yselick greinsende, en bevallen my int cieraet niet, eensdeels om datse sorgelick sijn voor bevruchte Vrouwen; Ten anderen hoewel des Werckmeesters suyver hant daer in blijcken can, soo isser weynich const inden omtreck, van dingen die an geen seker natuerlicke maet en stant verbonden en zijn.

Now since some people get such great pleasure out of adorning things with useless columns, that one cannot forbid them, but since they judge the works to be defective, when they turn out not to be an improvement after their brilliant ideas about columns, I would suggest that the thing that is defective is their judgement. Secondly, that for ornament's sake, people prop up the attics above the main rooms with obstructive columns, that according to the writings of Vitruvius, should be only thirty feet wide, which amount to five feet in each side elevation, reducing the space that is required there; that may be reasonable, to those who take such delight in the beauty of columns, that they would sooner suffer such inconvenience, than not get their satisfaction, this being something I do not want criticise too harshly: But to explain my own opinion here as well<sup>106</sup> seeing that the beams were long and strong enough, to make these attics even wider without having any supports, I would prefer to spend that money, which many people pay for these inconvenient columns, on some other ornament that did not create any obstacle.

3. DISCOURSE ON THE THICKNESS AND WEIGHT OF COLUMNS [missing]

4. DISCOURSE ON ARCHITRAVES [missing]

5. DISCOURSE ON FRONTONS

6. DISCOURSE ON ACROTHERIA OR PEDESTALS

Summarised by H. Stevin under the heading *Geschild Op beeldich cieraet, op nitsen, en op Clocken, en op Acroteria of Pedestalen*. (Discourse about artistic ornament, in niches and on Frontons) H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 112-113

As regards ugly monsters, with a mixture of the members of people and animals with hideous grinning faces, these do not please me as ornament, partly because they are frightening for pregnant women; secondly although the pure hand of a master workman may be discerned in them, yet there is little art in the profiles, of things that are not related to any natural measurements and posture.

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<sup>106</sup> Possibly the statement in Isaac Beeckman, 'Journael', fol. 23or. line 7 is a summary of the preceding passage.

Datmen verwonnen volck na botst, en tot haer verachting in plaets van pilaren stelt, die als slaven 't gesticht dragen, daer Vitruvius int begin sijns 1 boecx af verhaelt, dat en streckt tot geen geduericheyt, daermen in gestichten na tracht, want de fortuyn keerende, soo worden sy eerst ter neder geworpen, daer sy anders soudē mogen blyven staen.

Nitsen en nesten diemen met haer beelden oock tot cieraet gebruyckt, gestelt sijnde tusschen gevel pilaren, beletten daer veinsters te mogen commen en boven veinsters staende, sy en hebben geen vaster gront.

Daer sijnde die clocken<sup>135</sup> maken int middel open, daer het regenwater deur valt, niet doende den dienst daermense om behoort te maken, sulcx datse meer schynen haer oirspronck genomen te hebben, van de gene die niet en wiste tot wat eynde haer gebruyck streckten, dan met reden soo veroirdent te wesen. Soo ymant de cruyn sijns hoets uyt sne, sulcx dattet daer deur op syn hoeft regende, de gemeene man wetende waer toe hoeyen dienen, souder me gecken, gelijk sy oock soude met de geene die de cruynen van tympanen open maken, als sy wisten tot wat eynde die veroirdent zijn.

De drie acroteria of pedestalen, diemen volgens d'Antique, tot cieraet achter de clocken boven het dack stelt, daer Vitruvius af seght in 3 Hoofdstick sijns 3 boucx, en soude ick daer niet begeeren, om dese redenen: Alsoo het cieraet des gevels vereyscht beschermt te wesen tegen den regen, soo wort tot dien eynde de bovenste waterlijste of clocke verst uytstekende gemaect, dienende als voor eygen dack des gevels mettet cieraet datter in is; Maer boven dit dack noch cieraet te stellen, dat van geen ander dack beschermt en is 't gaet tegen de regel.

#### 7. GESCHIL OP UYTSTEECKSELS DER GEVELS [missing]

#### 8. GESCHIL OP BEELDICH CIERAET EN NITSEN

Summarised by H. Stevin under the heading *Geschil Op beeldich cieraet, op nitsen, en op Clocken, en op Acroteria of Pedestalen*. H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 112-113, see above

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<sup>135</sup> In the margin: 'timpanen, Frontispicen Cymatien'.

That one copies conquered people, contemptuously putting them in the place of columns, so that they support the building like slaves, Vitruvius tells of this in the beginning of his first book, that it does not provide any lasting fame, such as one aims to create in buildings, because with fortune changing, so they will be first pulled down, although otherwise they would have been allowed to remain.

Niches and recesses with statues that are also used for ornament, being placed between the columns in a façade, prevent windows from coming there and if they stand above windows, they have no firm foundation.

There are also those who make frontons that are open at the centre, so that the rain falls through, not fulfilling the function that they are supposed to be made for, so that they seem to have derived, from someone who did not know what their purpose was, than that they had been planned with good reasons. So if someone should cut off the crown of his hat, so that it rained through it on his head, the common man knowing what the purpose of hats is, would mock at him, just as they also ought to do with someone who makes the crowns of tympani open, if they know for what purpose they were laid out.

The three acroteria or pedestals, that one places as ornament on the roof behind the fronton, in imitation of antiquity, as Vitruvius speaks of in the third chapter of his third book, I do not care for it, for these reasons: in as much as the ornament of façades is required to be protected against the rain, for this purpose the highest drip course or fronton is made to project the furthest, serving as a roof for the façades with the ornament that they contain; but to put still more ornament on top of this roof, that is not protected by any other roof goes against the rule.

#### 7. DISCOURSE ON PROJECTIONS IN FAÇADES [missing]

#### 8. DISCOURSE ON ARTISTIC ORNAMENT AND NICHES

Summarised by H. Stevin under the heading *Geschil Op beeldich cieraet, op nitsen, en op Clocken, en op Acroteria of Pedestalen*. H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, pp. 112-113, see above

Op hoochde der camers na reden haerder langde en breede; en op redens van langde en breede der camers.

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, p. 115

Datmen ymant wil verbinden an hoochden der salen te moeten volgen langde en breede als inde Romeinsche salen gedaen wiert, niemant en isser an verbonden, Argumenta sumuntur ab incerta latitudine alarum & Tablini. Voorts een contoir 3 voeten breed soude moeten al te leech zijn, en dat ymant wil seggen, dat een contoir van 3 voeten breed en 6 voeten hooch, een mishagelicke form soude wesen, 't is opinie ; De betste reden blijft in alle camers groot en cleen even hooch sonder dattet qualick staet. En als men hem daer wil verbinden, soo sullen de bovesolderingen d'een hooger als d'ander commen, seer mishaecklick en ongerievigh.

Dat langde en breede der salen soude moeten volgen de reden van 5 tot 3 of van 3 tot 2 of van worter uyt 2 tot 1, en verbint niemant: Vitruvius self veroirdent de eetcamer int 6 boeck ant 1 Hooftstick in reden van 2 tot 1. Waerom sal dergelijcke in ander percken mishagelick wesen?

Separate notes and commentary on *Huysbou* by Beeckman

Aqua an comprimi possit [in the margin]

Isaac Beeckman, 'Journael', fol. 194r

*STEVYN, in de pampieren van Huysbouw, seght, dat hy in syn handt hebbende een glaesken boven met een kleyn gaetken, gelyck een speldepunt, ende het glaesken vol waters, datter boven op dat kleyn gaetjen een blaesken quam staen, solanghe de warme handt daeraen was; maer die daer af synde, sonck het wederom in, totdat de warme hant daer wederom aen quam ende so voorts.*

*In the margin: Stevyn etiam putat aquam plus loci occupare quam glaciem Daeruyt beschuydt hy, dat alle water koudt wordende, verkleyndt, ende warm wordende vergroot, ende derbalven dat het ys min plaetse beslaet dan het water ende dat daerdoor de glasen breken ende de steenen in de vorst vermorselen.*

*Doch dese opinie van het ys hebbe ick teghen alle andere physici, uyt Stevyns Waterwicht selve, vooren ergens oogenschynelick wederleyt, omdat het ys int water dryft etc. Ende van het blaesken, daer hy van seght, is gekommen van het verdunnen des lochts van binnen int glas; want het glas en kan niet heel vol water geweest syn. Dit blyckt uyt myn nagebotste gelas,*

9. DISCOURSE ON THE HEIGHT OF ROOMS DEPENDING ON THEIR LENGTH AND BREADTH

On the height of rooms depending on their length and breadth; and on reasons for the length and breadth of rooms

H. Stevin, *Materiae Politicae, Byvough der Stedenoirdening*, p. 115

That one should want to oblige people to make the heights of rooms dependent on the length and breadth as was done in Roman rooms, in fact nobody is obliged to do this, *Argumenta sumuntur ab incerta latitudine alarum & Tablini*. Furthermore an office 3 feet wide would then have to be too low, and should someone say, that an office of 3 feet wide and 6 feet high, is an unpleasing shape, it is just an opinion;<sup>107</sup> the best reason remains to make all rooms large and small equally high without it looking ugly. And if one wants to impose a rule here, then the attics of one will be higher than of another, which is extremely unpleasing and inconvenient.

That the length and breadth of rooms should follow the ratios of 5 to 3 or 3 to 2 or 2 to 1, nobody is obliged: in the first chapter of his sixth book Vitruvius himself lays out the dining room in a ratio of 2 to 1. Why should this be unpleasing in other compartments?

Separate notes and commentary on *Huysbou* by Beeckman which can not be located in text

Aqua an comprimi possit [in the margin]

Isaac Beeckman, 'Journal', fol. 194r

Stevin, in his papers on architecture, says that if he holds a glass in his hand with a small hole in it, the size of a pinprick, and the glass is full of water, that above that little hole a bubble appeared, as long as the warm hand remained there: but when it was removed, it would sink again, until the warm hand was placed on it again and so on.

In the margin: Stevin etiam putat aquam plus loci occupare quam glaciem. He concludes from this, that all water, when it becomes cold, gets smaller, and expands on becoming warm, and that furthermore ice takes up less room than water and that this is why glasses break and stones are also crushed in frost.

But this opinion about ice I have against all other physicists, from Stevin's own text on *Waterwicht*, rebutted as only apparently the case, because the ice floats on water etc. And as for the bubble, he says, it comes from the rarefying of the air in the glass; because the glass cannot have been very full of water.

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<sup>107</sup> Cf. for this passage Isaac Beeckman's commentary, 'Journal', fol. 227r. lines 31-35.



*daerdoor ick de koude afmete. So dan int gaetken wat vochticheyt sittende, wiert opwaerts gedronghen door de warmte des bandt, de locht van binnen uytgespreydt wordende.*

This was clear from my copy of his glass, by which I measured the cold. So with some moisture lying in the hole, it is driven upwards by the warmth of one's hand, with the air expanding within.



Appendices:

Texts, notes and lists of contents



Fragments of text intended for *Huysbou*



## Appendix A

### Isaac Beeckman: De Huysbouw van Stevin gecompndieert in 9 blaren

Middelburg, Zeeuwse Bibliotheek, HS. 6471, fol. 225 recto-233 verso.

Loci communes font formae omnium rerum agendorum virtutum aliorumque communium, thematum, communes, quae fece in usum variasque rerum humanarium aculterarum causas incidere possunt [] 1604

*Folio 225 recto*

Lines 1-4

Huysbouw van Stevyn gecompndieert in 9 blaren [in margin]

Men behoort de teijckeninghe des gesticht eerst sonder cieraet te verthoonen, want de teijckeninghe der leden dickwils veranderende ist moijelijck. ende het cieraet, maeckt dickwils dat men het quatste verkiest

Lines 5-6

Pylaren dienen tot looven en de groote percken diemen met geen balcken vervatten kan

Lines 7-8

Pylaren gebruijck men oock tot cieraet aen gevels, cassen &c daer men se tegen de oorden selve aen vast moet maecken

Lines 9-14

Het onderscheyt tusschen de antique ende moderne gestichten is dat het antycke pylarigh is, heeft geduyert tot over ontrent elff tot twaelff hondert jaeren, ende doen brochten de Gotthen het moderne op als sijn Torens van Antwerpen en Straesborgh maer van over hondertvijftigh of tweehondert jaeren is het antijcque dat is pylarigh cieraet wederom int gebruijck beginnen te commen.

Lines 15-17

De gevels soude ick sonder cieraet maken want daer groyt mosch op vervuylen ende en sijn soo lanckduyrigh niet als glat effer werck in geene deelen verheven dan daert gebruijck verheyst.

Lines 18-28

Wat aengaet de maten der pilaren en haer cieraet, ik houde dat geen ander regulen alleman int gemeen en connen verbinden dan die uuter de natuyr off om noodtsaeckelicke reden gemeen sijn. Gelijck S'menschen lichaem moet na geboots worden gelijk het is maer verscheijden soorten van pilaren en verciercelen te versinnen daer en is men niet meer aengehouden dan aen andere volckeren kleeren. De gewoonte doet wel veel, maer die is drijderleij te weten



volgelyck die men volgen moet als mans met mans cleere, schouwelyck diemen schouwen moet als [droncken]<sup>1</sup> drincken vrije als van te drijncken uit steenen, tinnen of glasen. Volge hier in de voornaemste bouwmeesters deses v. tijts.

Line 29

Hangende kamers en bevallen my niet; t' is cranck werck, beneemt licht, t' is ongeschickt, twaer beter twee heele camers met leeghe solders.

Steen gevels ofte haere freyten moeten door eenen gemeijnen regel onder swaerst sijn; daerom en deugen de uutstekende triglyphi niet, die mettet gewicht daer op kommende, wanwichtigheyt veroirsaecken. Om in houtwerck ist goet, omdat de ribben achterwaerts in de ribben gewrocht sijn, ende maken door haer uutsteeksels dan de regen sooveel tegen de gevels niet slaen en kan. Maer steene uutstekende kyckvensters, cantoortjens, &c en deugen niet meer dan uutstekende, uut navolginge des houts.

Lines 40-41

[In margin: welsandt] Het sant welt als het onderst water hoogher is dan de grachten, daert sandt in welt.

Line 42

[In margin: water hoet deur gat valt] het water van onder door een gadt: vallende maeckt boven opt

*Folio 225 verso*

Lines 1-8

water een putken, waer uut volght dat den pilaer water rechthoekig opt gat geduijrljck doort gadt valt sonder dat het nevenstaende water naert gadt compt, gemerckt elck deel vant nevenstaende water recht nederwaerts druckt op de grondt daert op staet. Vrage of het opgaende water dat meteen [spuijt/speuijt]<sup>2</sup> opgestegen wordt oock sulck een pylaer maeckt van de grondt beginnende ofte dat het bovenste nevenstaende water eerst opcomt.

Lines 9-14

Te vernemen of men van deselffde cleij niet wel beter steen can baecken als men wel op past. Soude men clinkaert niet rechts connen backen? Soude klinckaert niet goet sijn in gevels? Backt men classieren? Soude men geen moppen konnen backen van 16 duym lanck, 8 breed, 4 dick? om muyren van een steen dick te maken.

Lines 15-17

Daer is moortel van oude wercken harder dan haer steen, sulcx datse staende blijft ende den steen diep uutgevrosen is in forme als wafels.

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<sup>1</sup> Illegible due to stain: 'drincke'.

<sup>2</sup> Illegible due to stain: possibly 'sperijte'.

Lines 18-19

Gelijck des heelen rechten steijgers hooghte tot het aenleggen, soo is yder trapshooghde tot haer breedte.

Lines 20-24

Wesende in de grondtweyckeninghe eens wentelsteigers opt middelpunt der spille beschreven den boogh eens rondt soo verre de trappen strecken, gelyck des wentelsteigers hooghte tot den heelen boogh, alsoo yder traps hooghte tot haer booghsken.

Lines 25-27

De mueren van hoven kunnen beswaerlijck vast gemaectt worden, daarom soude ick daer een loove tegen maken ende alsoo met houte balcken daeronder styven.

[Illustration]

Line 28

Een huys voor een edelman die geen ambacht en doet A [beden]<sup>3</sup> voorsael ende lanck ontrent 34 voet, breed 17 voet, B de eetkamer, C de slaepkamer, D de keucken E de bottelrye elck van de viere lanck 17 voet,

*Folio 226 recto*

Lines 1-8

breed 21 voet. K en L sijnde plaetsen van de steigers. hieronder moeten vijff sulcke kelders comen, ende boven vijff sulcke kamers van binnen salt alom besedt sijn met casten, freijten, schoorsteenen, secreet, bedsteen, comptoir, regenback, fonteyn, [rommelinck hoeck]<sup>4</sup> verberghplaets, portalen, al neffens een int viercandt. het is quaet meer dan twee percken te maecken achtereen als men dit tot ambachtslien wil gebruijcken en hoef men maer A int midden te deelen

Lines 9-11

[In margin: landen verhogen] Om landen te verhoogen sal men alle jaer het aprilswater daer land oplaten comen ende het slijck daerop gesoncken sijnde wederom af laten, sal soo gemest worden gelijck het doet in Aegypten

Lines 12-14

[In margin: stynkende gracht ververschen] Om een stynkende gracht te ververschen sal uut eene goeden bornput daer veel waters in is pompen, het sal de cleyne moijsen en kosten wel weert sijn.

Lines 15-17

De gemaecte vaert van Brussel heeft op vijff mijlen 42 voeten vervals.  
Van Wyck tot Utrecht, wat verschil isser aen de vaert?

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<sup>3</sup> Illegible due to stain.

<sup>4</sup> Barely legible due to stain.

Lines 18-21

[In margin: kurck en biesbruggen kracht] Een stuck van de cleyne kurckbrugh is lanck 10 voet, breet 9 voet, dick 7 duijm, groot 171/2 voet, weeght droogh 366 #. Daer connen op staen 6 man, droog seynde.

Lines 22-24

Een cleijn stuck van de biesbrugh is langh 9 voet, breet 4 1/2 voet, dick 8 duijm, groot 27 voet, weeght droogh 200 # nat 472 #. Daer connen op staen, droogh synde 6 man, nat synde 5 man.

Lines 25-31

[In margin: grachten in sant graven] Men can alleen diepe grachten graven in sandt als men het water daerop laet comen ende alsoo het wellen te benemen. Men sal in de [...] <sup>5</sup> grachten met baggeringhe want [neven de] canten en breucht geen behoerlijcke diepte. Int midden dan compt een kiel [?] [totdat] het sandt alte steijlliggende souden [wellen] [?] in de kiel singkt gelijk ment in een tobbe met sant en claer water gevult licht besien can

Lines 32- end

[In margin: tras legghen] Om kelders in tarrast te legghen, men leght eerst sandt daerna een bedde van calck, daerop legt men dropsteen in tarras, seven steenen hoogh, ende ondertuschen viermael overal met tarrast.

*Folio 226 verso*

Lines 1-2

Tarrast versteent wel int water alst niet geduerich door en loopt, in ses weken; buijten t'water in veerthien dagen.

Lines 3-5

[In margin: kisten te dansick] Te dansick worden kisten gemaect die men vol steenen doet ende alsoo laet sincken in de riviere in stede van hoofden om schueringe te maecken twelck my goet dunckt.

Line 6

Stelijns in de Bouwkonst ghesien, den 26 Junij 1624

Lines 7-9

[In margin: een myle] Men reket een uyre gaens 20.000 voet. Een parasange was 18750 voet, want sy doet 30 stadien. Een halve stadie doet 125 pasen; een passus doet 5 voet

Lines 10-17

[In margin: moortel] Een droppel sweets is beter in de [in de] <sup>6</sup> moortel dan een eemer waters. Nochtans als men t'moortel te veel bearbeyt, soo wortse waterachtiger dan mense verarbeiden

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<sup>5</sup> Illegible due to stain.

<sup>6</sup> Here 'in de' is written twice, presumably by mistake.

can. Wat raet? Men sal beginnen de moortel te maecken een maendt eer mense besight, mengende calck, sandt en water naer behooren, en sooveel als men van doen sal hebben, ende daernaer alle dagen eens omwercken, hiermede drooght het water uut ende wort gesmij ende vet.

Lines 18-23

[In margin: Groote wercken metselen] Groote wercken moet men lancksamelijck opmaken, alsoo dat de onderste lagen drooghe sijn eermen daervan nieuw wederom op werckt. Want de vochtigheyt van de bovenste kalck dringht door tot beneden ende houdtse soo week dat het sticht wel somtijts valt. Men weet dat de lage droogh genoegh is alsoe begint te schimmelen.

Lines 24-28

[In margin: Spleten te stoppen in tarrast] Om te stoppen een splete in tarrast, daer water door comt, men sal nemen een deel roomenij, dat mael sooveel ongeblust, ende cappelingh van botermelck, dat men van boven met een lepel van de melck sal scheppen alsoe begint te sien, ende maken daeraf een pap.

Lines 29-31

Ik moet aen de metsers vragen oft niet goet en soude syn in de overwelfsels seer weijnich moortel te leggen om min te crimpen.

Lines 32-33

[In margin: Steen hoedanigh] Huysen van backsteen syn beter als ander tegen den brandt; sy en springen niet in stucken als int vier gemaectt synde

*Folio 227 recto*

Lines 1-3

Ik soude voor goet verstaen backsteen soo groot ende swaer maecken als een man bequame-lick verleggen conde, als van 50 of 60 pont, want het soude stercker werck sijn.

Lines 4-7

Bentemersteen is de beste, daerna Walschbrabants wit arduyn, daerna levendel; maer perpensteen is de slechtste soorte, doch is bequam om in de gront te leggen van sware gestichten, want het wast binnen 9 of 10 jaren aen malcander.

Lines 8-13

[In margin: Nieuw aen oudt gemetselt] Nieuwe mueren, aen oude gewrocht, worden altijt wat leeger, niet omdat de gront sijncet want de onderste jointuren kommen best overeen. maer omdat de mortel krimpt. Daerom sal men de moortel wel bearbeijden en dan daerop leggen ende groote steene maecken, of die aeneen maecken met gegoten loot in plaets van moortel.

Lines 14-18

[In margin: Kalck hoedanich] Doornix calck is de beste omdat het aen de steen harde vereenicht; daerna Maescalck, dewelcke gemaectt wordt van blauwe ende witte arduyn. Maer Leydts calck, gemaectt zynde van gebrande zeeschelpen, maeckt vochtige muyren om de souticheytswille.

Lines 19-21

Backsteen moet gemaectt worden van goet kley ende wel gekneedt. Klijnckaert en kan men niet houwen, maer wel slijpen.

Lines 22-28

[In margin: Swaluwsteerten van houdt] Dewyle de steen is buyten ende het hout binnen, soo is de hechtighe van beyde noodich; sal derhalven geschieden met sulcke ingehouwen steenen daerop houters passende die men heet geswaluwsteerte regels, genagelt aen de groote stylen ende steenen van boven, daeraen gedaen die neerwaerts schuifvende.

Line 29

Der timmerlieden beste instrumenten sijn sage, boor ende schave.

Lines 31-35

De cruys van A en is niet goet, maer van B, omdat se aen twee malcanderen rakende syde is

[Illustration]

*Folio 227 verso*

Lines 1-2

Beste daken loof met potaerde ende tras, en steen daerop. Elck bysonder en is niet goet.

Lines 3-7

[In margin: Houdt goet houden] Tegent splijten van houdt bestrijckt ment vuijle olij ende smeer; men legget buyten de son en wint, niet op malcanderen; men begravet in het sandt. Het houdt wordt oock van de kalck opgegeten. Daertegen beperckt men sooverre, of men legget in een gehouwen steen. In drooge moortel ist beter dan in natte.

Lines 8-12

Esschenhoudt clieft wel en is goet tot spiessen ende diergelijcken. Elssen is bequam tot hoofden ende dyckdammen, maer niet tot timmeringe. Tot kammen ende staven gebruijckt men hardt hout, als bosboom, mispelboom, doornen, quernoellen. Huypenhout is goet tot valgen van wielen; ten clieft niet.

Lines 13-18

[In margin: Yser wellen]. Wellen is yser aen yser smeden. het moet heet genoegh sijn, twelck men merckt aen seecker blaewicheyt; anders en hecht het niet, maer al te heet verbrandt het en wordt broos en bedorven.

Spaensch yser is het tayste ende beste, doch onlicht ende niet suyver, Naems yser is het suiijverste om te vijlen, maer anders het brooste. Hierlandts is beter, oock beter dan Sweets.

Lines 19-27

Ick hebbe den roock sien beteren met wat waters te gieten op den heert rondom het vier maer het selve water uitgedrooght sijnde begonst het wederom te roocken. Ick hebbe den roock sien helpen met eenen rechten stock overeynde in de schoorsteen over het vier te steken. Men sydt

dattet in hollandt meer roockt dan in andere landen omdat men daer meer turf brandt, ende de vrouwen daer [curicher] zijn op haer witte muijren daerom wort het hier meer gesijt.

Lines 28-30

Pijloot comt van pijl en loodt, want het loodt datse gebruycken, is scherp gelijk een pijll, om ras door het water te vallen. Pijlen ofte peijlen is één dinck.

Lines 31-35

De hooghde der kamers en moet juijst niet volghen de lenghde en breede, want een cleyn can-toor drije voeten breet soude moeten alte leeghe sijn, de bedste blijft in alle camers groot en cleijn even groot sonder dat het qualijck<sup>7</sup> staet.

Lines 36-38

[In margin: Kisten te Dansick] De kasten<sup>8</sup> daermen te dansick in de riviere de hoofden van maectt om diepte te krijgen, syn lanck 42 voet, breet 30 voet

*Folio 228 recto*

Lines 1-10

[In margin: Pleysteringh of leemplacken] Pleysteringh (seggt de pleysteraer) wordt gemaectt van cleij met calverhaer ende geraept hooij, lanck 5,6,7, of 8 duym, gemenght. Dat strijckt men tegen de solder; daerop nagelt men wilge latkens, daerop strijckt men dan witte Doornixen calck gemenght met wit calverhayr ende noch wat anders (dat de pleysteraer niet noemen en wilde). Daerna boetseert men daerop alst wat drooge is, doch soo dat men de calckxgroeven tot in de kley douwen can. Alles hout aeneen door her hayr, maer men moet het kalck hier ende daer douwen in de kley.

Uut Stevijns papieren gheteijckent den 29en junij &c 1624

[Passages from Singconst follow]

*Folio 229 verso*

Lines 16-20

[In margin: Sandt onder water is vaste gront] Sandt onder water liggende, maectt vaste grondt, want het water vervult de ledige plaetsen tusschen de sandekens soodat het geperste sant niet wijcken en can. men vint sandt daermen qualyck met scherpe schuppen in geraecken can. men moet de heypalen door het drooge sandt slaen tot in het harde.

Lines 21-22

Te Rotterdam is een qua modderige grondt van 60 voet van dick, daer geen heypalen lanck genoech toe syn.

---

<sup>7</sup> Barely legible.

<sup>8</sup> 'Kasten' is written here, in contrast with the note in the margin. Stevin meant 'kisten' or caissons.

Lines 23-26

[In margin: gelyckseydicheyt gepresen] T gesticht moet wesen als een dier dat is lijcksijdich dat is den rechtersijde gelijk aende slijncker, en mejne de Grie-cken haer voor symmetria alsoo verstonen ende niet saemmaticheyt gelijk Vitruvius seght bestaende in de reden die des menschens voet heeft

*Folio 230 recto*

Lines 1-3

tegen sijn hoofd en ander leden, anders ware hij mismaeckt: want ander dieren voeten en komen met den menschen voeten niet overeen; ende en sijn en met haer ander leden niet evenredig met den menschen.

Lines 4-6

Sommige menschen en hebben niet meer behagen in gelijcksijdicheyt dan anderen in de musijcke ende int begripen vant intoneren. Maer sijn Excellentie [...] vande musijquelijcke genentheyt met tot lijcksijdighe bollewercken

Line 7

Als van de twee maer een mach wesen 't gerief wort voor het moij gepresen.

Lines 8-9

Die seggen varietas delectat als van Landschappen met bergen dalen velden boschen en moeten haer met de bouwconst niet moijen.

Lines 10-12

De lijcksijdicheyt wiert vande Grieken onderhouden niet alleen [inde] gevels maer oock inde camers en percken gelijk uut al haer gedruckte gestichten bewesen worden can.

Lines 13-15

[In margin: bornputten] De bornputten worden best met hardtbacken steen ende trast omsedt, opdat het water van onder door het quelmsandt, en niet van tersyden door modderigge grondt, daerin comen soude.

Lines 16-20

T' Amsterdam is een put in de aerde geboort 232 voet diep in 21 dagen kosten met ander onkosten 800 guldens Int oudemanhuys den eersten dach boorden sij 51 voet diep, de laetste dagen maer twee voet t' daechs de gronden waren 7 voet gehooghde aerde 9 voet darrij en veen, 9 voet weecke cleij, 8 voet sandt, 4 voet eerde

Lines 21-27

[In margin: bornputten hoe sij geboort worden] De vont vant booren in de grondt bestaat voornaemtlyck daerin dat men den put altyt met water opvult hooger als het onderweerst water,

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<sup>9</sup> 'Vlek', presumably originally 'heeft'.

want alsoo en can de gront niet weder opcomen. Aldus can men oock dieper grachten maken met bagger onder water dan met uuthoosen. Dit water soo hoogh in de put staende, hout het sandt aen de syden des geboorden puts staende doordien datter veel meer persinck is van binnen dan van [buyten].<sup>10</sup> Besiet het Waterwicht.

Lines 28-39

[In margin: gronden van geboorden bornput] De gronden van geboorden put int oudtmanhuys

Gehooghde aerde	7	voet
dary en veen	9	
weecke kley	9	
Sandt	8	
aerde	4	
kley tamelick hardt	10	voet
aerde	4	
Sandt daermen hier in Amsterdam daerop heydt	10	
heel blaeuwe clay	2	
wit sandt	4	
Folio 230 verso		
Lines 1-12		
saver aerdt	5	
mollem	1	
sandt	14	
Sandt eerst met wat cley gemenght daerna schelpen en horenkens	9	
Harde kleij alte met gemenght met haer en schulpen	36	
Vande selfde kley	66	
Sandt met steenkens gemeijngh	5	
Sandt	29	
	232	voet

Lines 13-14

Het water dat uut desen geboorden put quam was bequam om mede brouwen.

Lines 15-18

[In margin: Fonteyne van een bornput] Dit water comt te staen in de put 1 1/2 voet hooger dan het gemeijne water des grachts, loopt altyt gelijk een fonteyne. D'oorsaeck schijnt dattet land vanwegen de hooge wateren hooger doorweijckt sijnde dat het gemeyn water, daerom hooger uut can loopen.

Lines 19-20

[In margin Erwten te koocken] Erweten en connen niet wel met putwater gekoockt worden maer met eygen water.

---

<sup>10</sup> Here the word 'buyten' appears to have been omitted.



Lines 21-24

[In margin: regenback suyver] Van de vuylicheyt uut den regenbacken te sluyten maken sommige sijnbaecken of cisternen van weijcken baksteen daert water doorsijpt uut den ontfanger maer t'is beter na sommige wijse dat door sandt te doen.

Lines 25-28

[In margin: secreten te maeken] Men sal de heymelicxste putten tot onder het quelmsandt graven dan sijncet de strondt<sup>11</sup> vanselve wegh waent sij wordt int water vlietich. De huijskens sal men overwelden ende bemuijren tegen den stanck.

Lines 29-30

[In margin: stanck van doode creaturen de felste] Den stanck vant ingewant van visch ende gevogelte is walgelijcker danvan stront, gelijk men siet in [lege] van de doode menschen ende beesten velijselycker stincken dan de stront opt schijvtelt, ende en vergaet soo haest niet door [regen] dat die int water [niet] vlieticher worden soo verspreidt als stront doet.<sup>12</sup>  
[In margin bornputten] De dieptste bornputten en sijn niet altijt de beste maer die haer water door sandige grondt ontfangen

Lines 31-33

[In margin: secrete lochtgaten] Lochtgaten in de heijmelicken te maecken is misverstant want de stanck van de put vermindert wel maer treckt doort huys.

*Folio 231 recto*

Lines 1-3

[In margin: kelder onder water kommende] T' Amsterdam is onlancx int gebruijck gerocht<sup>13</sup> het deel der kelders dat onder water kompt van hout te maken ende stoppen dat met mos ende teer, ende onderhoudent gelijk de schepen.

Lines 4-5

De freyten sullen van binnenshuys aen de gevel komen van onder tot boven tusschen de veynsters. Onder dickst.

Lines 6-7

Alle sloten sullen met bijzondere sleutels opgaen maer den heere van den huysse salse alle opconnen doen met eenen slotel.

Lines 8-9

De kijckvensters sullen maer soo verre buijten commen dat men ter sijde ende alom gemakkelijck sien kan.

---

<sup>11</sup> Actually the text reads 'sondt', the writer of the notes in the margin changed this to 'strondt'.

<sup>12</sup> Barely legible words are placed between square brackets.

<sup>13</sup> H. Stevin wrote: 'getocht'.

Lines 10-11

In steene gevels behooren allom steene cassinen te staen want de houten verrotten en vergaen in de locht van buyten.

Lines 12-14

Glaese veijnsters in cosijnen ende daken in gevels en diergelijcken behooren een duym diep daerin te comen, want dan is het strycken met stryckmortel hebbelycker; t'en splyt soo niet, is dichter ende valt niet aff.

Lines 15-16

Geschilderde glasen en bevallen mij niet men mach die kost besteden tot geslepen glas soo claer als of [sergens]<sup>14</sup> voor en stonden.

Lines 17-18

Moluren ende ander cieraet der gevels, daer water in kan blyven leggen, bevallen my niet.

Lines 19-21

Veijnsters opgaende deen helft nederwaerts ende dander opwaerts sijn goet want het opperste is gelijk een dexel ende en clappe soo niet noch] en verhinderen niet.

Lines 22-23

Veel hout aen een huys is goet, want het stijfft geweldich alst slechts uut de regen ende wint staet.

Lines 24-29

[In margin: houdt waerom het splijdt] Het hout splijt van de sonneschyn, gelijk het kley voort vier, om het haestich uitgaen van de vochticheyt uut het uuterste; soo wort het uutertse minder ende en kan het binnenste niet vatten. Daerom spleijt het. Maer buyten sonnenschijn drooget van binnen en van buijten samen. Daerom leyden de Egijptenaers het nieu gehouwen hout een jaer lanck onder het sandt.

Lines 30-32

[In margin: glacies minus est sua aqua?] Alle verkouwende wateren vercleijnen, ende daerom is het vervrosen water cleynder dan doent vlietich was, waerdoor glasen &c. met water omstucken breken in de vorst.

Lines 33-35

De architraben of existilia, dat is opperbalcken, en bevallen my van steen niet, want steenwerck crijcht vasticheyt met bogen ende niet gelijk houdt.

Lines 36-37

[In margin: gelijkseydicheyt] T'gebou moet sijn gelijk een dier 't sij vogel, visch of cruijpende of ander, daerin siet men dat de rechtersijde wel is gelijk

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<sup>14</sup> Barely legible.

*Folio 231 verso*

Lines 1-3

de slijncker, maer het voorste en is niet gelyck het achterste Daerom en ist oock niet noodzakelijck in de huysbouw het achterste te maken gelyck het voorste.

Lines 4-6

[In margin: stoven van yser] In de stoven brengen dobbel gelaese veijnsters groote warmte. Dit moet gesocht worden in de winter alst vriest met een tonneken in een groote tonne te hangen, wat dat wel scheelt int vriesen.

Lines 7-9

Den roock inde Stoven gaet wech soomen d'eerste mael int begin des winters de stove seer heet roock men doeter oock wel rieckende dingen in, maer die reuck en duyert er niet lange in.

Lines 10-12

[In margin: schulden hofhoudinghen] De schulde der hofhoudingen des jaers 1612 sijn 1875481/2 ende des jaeren 1613 oock so soo veel min 15080, van de polyticke tractamenten ten compt samen de somme der schulden

[Illustration]

Lines 13-16

Dit voorgaende is een wel geordineerden block van acht huysen met vrije licht plaetsen in de witte percken bevrijdt van dieven, geen muijren van hoven komen aen straeten, de geartseerde en getippelte viercanten betiejkenen camers hier blijkt overal de lijkseydicheyt de vier huysen hebben dobbele lichtplaetsen.

Lines 17-18

[Illustration] A is crancker B want e/f/g uitgehouwen synde, is B gelyck A

*Folio 232 recto*

Lines 1-9

[In margin: Houdt aeneen is stercker dan gescheyden] Men sal eenen solder maken stercker met balcken dan met plancken alleen. Dan al heeft d'een sooveel hout als d'ander als te sien is in twee camers, elk van 24 voet lanck en breed, d'eene hebbende 5 balcken elk een voet dick ende de plancken een duym dick: op d'ander camer een solder overal 3 duym dick. langse te vooren<sup>15</sup> Houdt aeneen can meer dragen als gescheyden, als blijkt doen ick aen twee stocken gewicht hinck totdat se braken. Daer sagh ick hoeveel meer als dobbel gewicht datter hangen konde aent heel houdt dan aent geloooven. Alsoo ist oock best in de overwelfselen sommige stercke bogen te maken.

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<sup>15</sup> The words 'langse te vooren' are written as a separate sentence.

Lines 10-13

Om overwelfselen te maken is eens booghs kleynder deel stercker dan syn grooter deel, de freyten sterck genoegh sijnde ende buyten twyffel, want de freyten stutten ende ondersteunen de nederste eynden des booghs, die andersints van binnen bloot ende dunder staende soudon oock syn.

Lines 14-19

Die met de kortste pesen sijn de sterckste, wel verstaende als dickte en hooghde des muers van d'een en d'ander boogh even. groot is. Oock sijn de boghen eens overwelfsels, de rechte linie naest wesende, de cranckste, alsoo dat rechte linien, streckende lanx de cruijn des overwelfsels, dit geen sterckte, maer beswaringhe geeft, gelijk men in veel kercken<sup>16</sup> siet.

Lines 20-21

Ick moet ondersoecken, waerom ronde overwelfsels, als brootovens, soo sterck syn, nochtans sooseer pladt wesende.

Lines 22-26

[In margin: balcken verrotten aen de eynden inde muer] De eynden der balcken, soo verre sij in de muyer steken verrotten wel tot de gront toe in 60 jaeren van wegen de scherpe bytende intreckende vochticheydt des nieuwen moorters. Misschien is dit te helpen, soomen die eynde bestreke met spiegelherst, gelyck men sommige bierkisten doet.

Lines 27-29

De huysen ontsetten haer dickwils ende men en weet niet vanwaer het compt. Doch can gebeuren dat het stryckhout, heel in de muyr leggende verrot is of crimpt, ende alsoo de reste moet sacken.

Lines 30-32

De wyste kelders, die hier te landen vallen, meugen van 26 of 26 voeten syn. Worden overwelfft met een boogh van een backsteen dick.

Lines 33-39

het [tegeldack]<sup>17</sup> ist beste omdattet langer duyrt ende het water en loopter soo deur gelijk int pannendack want zij leggen de 2/3 delen oopen ende alsoo valt het water dat soude mogen dringen door den oppersten tegel op de ondersten De pannen worden bestreeken alsoo dat het water dat door[sijpt]<sup>18</sup> sinckt in huijs moet vallen waerdoor het onbestreken pan meer dicht is want de droppelen loopen van onder wederom bujten op dander pannen door de gerren.

---

<sup>16</sup> De Waard transcribes it as 'keucken', with vaults I would be more inclined to read 'kercken'.

<sup>17</sup> Illegible. From the context in Hendrik Stevin's printed version, possibly a tiled roof.

<sup>18</sup> Illegible.

*Folio 232 verso*

Lines 1-3

De cruysdaken en syn t' verstoppen des snees niet onderworpen ende deselve valt al op de eijgenaers grondt, De solders krijghen daer door gevellicht ende worden veel ruymmer.

Lines 4-6

Een steyger in een camer, lanck 24 voet, sal afdakinge hebben van 18 voet. De hooghde sij 12 voet. Dats een trap hoogh 6 duym, breet 9 duym.

Lines 7-9

Cruysdaken en lijden soo grooten geweld niet van stormen, omdat se van alle sijden met muijren besedt syn. vallen schoonder in d'ooghe, syn versekert tegen buyrdackdieven.

Lines 10-13

De daken op borstweren en bevallen mij niet omdat se door wint [&c] seer krencken maer op solders worden daermede vast gehecht aen de balcken want de muijplaeten worden vastgewrocht aenden solder.

Lines 14-18

De rechte daken bevallen mij noch beter dan cruysdaken, omdat se steylder vallen; de gevels hooger comen tot beter bewaringe der daken ende schoonder in de ooghen. de gaten en verstoppen niet. Maer alst water in den regenback vervriest ende dan snee valt, ende daerop grooten regen, soo cruypt het water in huijs door de tegels.

Lines 19-20

De rooleijdack kost 20 gld., pannen 8 guld., 100 verglaesde pannen 5 gulden, ander 36 st

Lines 21-22

[In margin: Nautarum in Hollandia numerus] In hollandt sijn over de hondert duysent cloecke ingeseten seevarende mannen.

Lines 23 -25

De blocken van huijsen in groot [...] <sup>19</sup> tes steden houde ick tvoor bequam van 360 voet en elcke sijde [rugghelincx] tegen malcander te comen.

Line 26

[In margin: suyvel quid] Onder suyvel verstaet men, melck, room, versche caes en boter.

Lines 27-29

De beste maniere van goten in een stadt is int midden der straten ende die overwelft; ende van elck huys daertoe oock van een overwelft gootjen met trailjen. Alsoo is de stadt bevrydt van stanck ende leelickheyte.

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<sup>19</sup> Illegible.

Lines 30-32

Looven behooren voor al de huijsen te sijn de Stadt [voor ondergaen] mochten men mach oock binnen looven maken op vier pylaren t wel rust

Lines 33-34

[In margin: in urbis latitudo maxima]<sup>20</sup> Groot steden en behooren niet breeder te sijn dan 5820 voet opdat men alom niet verre van buijten en sij.

Lines 35-36

[In margin: sluysen] Schuerende water maeckt door den wijde sluyse opcanten meer schueringh t selve water door een nauwer sluyse op

*Folio 233 recto*

Lines 1-2

Sluysen wijder dan na behooren vervuijle want die vervuijlen van binnen ende de deuren en connen niet toegaen.

Lines 3-8

[In margin: Architecturae domesticae Stevini Synopsis]

Hoofstukken ende deelen des Huysbouws

- I Hoofstuk Vande lijcksydicheydt des gebous
  - 1 Van de bepalinge ende beschrijvinge der lijcksydicheydt
  - 2 Vande lijcksydige ordeningh der Romeynsche burgerlicke huysen en gemeene gestichten
  - 3 Van de lijcksydige ordeningh der Grijkxse burgerlicke huysen

Lines 9-14

- II Van de onderaertsche werken
  - 1 Van de grondtvastigh
  - 2 Van de bornputten, pompen, santboringh
  - 3 Van de regenbacken
  - 4 Van de heymelicken
  - 5 Van de kelders

Lines 15-19

- III Van de gevels
  - 1 Van de freyten der gevels
  - 2 Van de deuren en veijnsters, die in de gevels commen
  - 3 Van de waterlijsten
  - 4 Vant cieraet der gevels

---

<sup>20</sup> Text in margin of Beeckman's text not mentioned by De Waard.

Lines 20-27

iv Van de steegers

- 1 Van de bequamheden ende onbequamheden dieder in stoff van steegers dient bedocht te wesen.
- 2 Van de bequamheden ende onbequamheden der wentelsteegers
- 3 Van de steecksteegers
- 4 Inhoudende voorbeelden van gemeijnghe steegers na bedwongen plaets.
- 5 Van eenighe telkonstighe rekeningen, die in de stof van oirdening der steegers kunnen te pas comen.

Lines 28-32

v Van de solders en overwelfsels

- 1 Van de steene overwelfsels
- 2 Van houtse solders
- 3 Van gepleijsterde solders
- 4 van de daken

Lines 33-35

vi Van de ordeningh der deelen eens huys als der camers lichplaetsen, gaelderijen, hoven blocken ende ten laetsten der deelen welcke een camer heeft

*Folio 233 verso*

Lines 1-14

- 1 Van de verwoeginghe der lichtplaetsen eens huys
- 2 Van de verwoeginghe der lichtplaetsen eens blocks burgerlicke huysen
- 3 Van de verkiesinghe der kamers of percken, elck tot haer gebruyck met insicht door welcke dat men bequamelick gaen mach of behoort te gaen om tot de andere te comen deur welcke niet.
- 4 Van de verwoeginghe der camers of percken, die samen het het huys maken
- 5 Van de verwoeginghe der hoven
- 6 Van de verwoeginghe der gaelderijen
- 7 Van de verwoeginghe der stucken, die in camers of percken vereijst sijn, als steegers, portalen, schoorsteenen, schryffkasten, heijmelicken, fonteijnen, brandinghplaetsen, regenpijpen, leuven

Lines 15-24

vii Van de ordeningh der steden

- 1 Van de middelen daer men groote en machtige steden door maken can
- 2 Van de verkiesinghe der plaetsen, daer men de steden wilt leggen
- 3 Van de form der steden
- 4 Van de sluysen
- 5 Van de havens
- 6 Van de hoofden
- 7 Hoe men omt verdrincken der steden te voorkomen, bedyckte landen doet hooger wassen die daerme oock vruchtbaerder sijn

Lines 25-29

Verscheyden aenteijckeninghen

- Van Metsalerije
- Van Timmeringh
- Van Smedingh
- Van Roock

Line 30

Aenteijckeninghen op Serlijns en anderen.

Texts (partially) intended for Stevin's treatise on architecture not in Beeckman's extract of the Huysbou, but between his other notes

Isaac Beeckman

Middelburg, Zeeuwse Bibliotheek, HS. 6471, folio 206 verso - 208 verso

Loci communes font formae omnium rerum agendorum virtutum aliorumque communium, thematum, communes, quae fece in usum variasque rerum humanarium acluterarum causas incidere possunt [...] 1604

*Folio 206 verso*

[Top of text] Waterschueringh

[In margin: waterschuering]

Een rivier haer in twee scheidende, is die deelen tot een ander plaets wederom versamelende: het cortste heeft de snelste stroom ende meeste schuering. Want daert beyde een is, ist even hooghe, ende als yet langher daelt ende niet leegher en kompt dan dat corter daelt so moet het tragher gaen. Doch t kan gebeuren dat het kortste trager, loopt, te weten, als haren inganck seer eng waer ende daer achter breed of int middel veel dieper dan aen de eynden. Daerom moet men nieuwe vaerden aen rivieren korter graven dan den wech, die het water in de rivieren loopen moet eert an de leeghe mont van die nieuwe vaert geraeckt als ick segghe het cortste heeft sleeste<sup>21</sup> stroom, versta ick caeteris paribus.

Alser een kleyn rivierken neffens een groote gegraven wort, onder ende boven daer in komende, so sal dat kleyn rivierken altyt neerwaerts loopen, indien de groote riviere altyt neerwaerts loopt. Maer soder daer inde groote ebbe ende vloet gaet, so gebeuret wel dat aen beyde de monden der kleyne het water seffens in of uyloopt, te weten als de kleyne droogh loopt, en geschier voornementlick in kreen die langst syn en daer veel plat landt by is op de langhde van 400 stappen.

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<sup>21</sup> De Waard is correct in reading 'sleeste' here. In Hendrick Stevin's printed text we read 'snelste'. This is logical in the context. Perhaps Beeckman was unable to read Simon Stevin's handwriting correctly while his son could.



[Illustration]

De kreek, daer de vloet op een selfde tyt so wel aen C als aen E incompt en hebben gemeenlick gheen deurgaende schueringh: Want aen D, daer de stroomen malcanderen ontmoeten (hier te lande genoempt wantijen), en valt gheen schueringh, ten ware datter aen D eenen inham ware daert water introck tot aen F, maer daer in sal altyt aenwas geschien.

Alsmen kreecken maeckt uyt revieren,so moetmense maken van schoorkant tot schoorkant, en niet ande strandtsyde, want het sandt, daer synde, beledt als dorpel het water met overvloet in de kreen te schuyven.<sup>22</sup>

Men sal oock de monden vande kreek legghen na de scheute der groote riviere, als het water van A kommende, kompt beter in C dan oft van A in E kommen moest, ende uyt E gaet het gemakelick, omdat het revierwater ooc na B loopt. Het water verliest in water syn schuerende kracht.

Tis eenen gemeenen regel dattet revier water sonder ebbe ende vloet totte nauste plaetsen ten diepsten is, maer in zeewater en komen de klyne kreek van 3 of 4 voet breed uyt zeestrandt naulick sienlick greppen<sup>23</sup> maken, maer worden met de vloedden so seer geeffent alsse met de ebbe verdiepen: maer seer groote kreen als de sluysscher haven cryght groote diepte:want onder evesnelle stroomen moeten de breedste diepst worden, dewijlen desen daer in vallende daer door niet en verminderen, ende de kreen en souden en konnen niet diepen sonder te verbreden, en dat het sandt onder afvalt. hiertoe dient oock de groote kreek tusschen Vrankrijck en Engellant, welcke niet tegenstaende sy seer breed is, nochtans de duytschen see een groote boesem synde daer de spaensche met haer getye tot en in schuert, so is die kreek (so ick se so noemen mach) seer diep. Sooder benevens de Sluysscher haven gemaect wierden noch seven anderen gelycken al loopende in die selfde verdroncken landen, so en souden den stroom vant Sluysscher gat so diep niet worden en dat het verdroncken landt dan weer vervult souden syn. En wint kan oock het water ophouden also datter in sommige gelegentheyt van kreecken het water ebt alst behoorde te blijven en ter contrarien.

Men kan oock in sommige gelegentheyt van rivieren een bequaem rondt stuck lants gansch in stroom bevanghen, als de rivier bijna een ront maecken, dan sal men dat met een kreek an een maken, doch also dan de kreek so uijt niet en [zijn] dat den loop van de groote riviere te veel vertragghen ende also den bocht versanden. daerom salmen met hoofden, cramming of crippling de kreek in sijn behoorlick naute houden ende de scheute des waters synen oude wech<sup>24</sup> doen verkiesen.

[In margin: landen schynen te krimpen] na de bedyckinghe en worden de landen niet hooger, ja en datter de sprinckvloeden niet op en kommen, soo leegghen sy en crimpen in, en so eenighe segghen gageslaghen te hebben, het gewas der vruchten afgemaect wordende duerst jaerlickx verminderen. Voor Sluys is in weynich jaren 4 of 5 voet verhooghinge geschiet: ende op plaetsen naerder de groote rivieren als de Schelde, Maes en Ijssel bevindt men den aenwas op sulcke tit hooger om bekende oorsaken.

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<sup>22</sup> De Waard correctly read 'schuyven'. It is possible however that 'schuyren' was intended.

<sup>23</sup> In the printed text: 'grippen'.

<sup>24</sup> Deleted: 'te'.

[In margin: Havens open te houden] De beste maniere om havens open te houden en grote schepen te ontfangen is doort schueren, met twee sluysen diemen bij beurten open doet daermede den heele houwer diep gehouden wort. En soomen hoofden diep in see duer strecken die verwering des mont vaent in vallen des sandts, ende het water verliest anders [te zwich] in de breede kommende syn schuerende kracht, daert met die hoofden schuert tot daer de zeer diep diepte krijght. Also soudemen te Middelborgh behouden deur de duynen twee nieuwe vaerden te delven vande stadt noortwaert, want na de Vlaemscher cant neemt den anwas te seere toe. Steden als oostende op de Zeestrandt en verder uytstekende dan de gemeyne streke van de buytenkant der duynen lijden geweldighe schueringh der zeestroomen, en tis te vermoeden datse eerst so niet gelyden [gelycken?/gelegen] en is maer dat de duynen afgespoelt sijn en sij blyven staen door cost van arbeydt.

[In margin: sluysen die bequam sijn]

Alsmen met sluysen veel wateren tseffens loost, hoe wel het so langhe niet en liepe, nochtans maect men daer door de meeste schueringh, want een kleynen water syn meeste macht der schuering gedaen hebbende en sal deur langhe loopen niet veel meer dan diepen, volcht andersins alle rivieren geduerlick loopende souden altyt dieper en dieper worden, gelyck 400 pont lang in den schale ligghen soude eerst 500 pont in dander op soude doen gaen, twelck 600 pont strackx doen. Nochtans kan men de sluysen wel te groot maken als grooter sijn dan de santkreke daert water deur kompt, want dan verkleyen sy, daerom moet daer een weynich [mis/win/min] water door konnen dan door het dryhouckich gat daer twater door kompt. De kreke in cley hebben stylder kanten dan in sandt, gelyck oock doen die met kripping en ryswerck gemaect en onderhouden worden.

[In margin: schueren met ebbe en vloedt]

Schueringh met louter ebbe en vloet in besloten dobbel houders sonder rivieren daer in te kommen, geven meer geriefs, en syn beter havens dan met rivieren in dit aensien. ten eersten datse gheen schadelicken ysganck onderworpen en

*Folio 208 recto*

syn, ghelyck de rivieren, maer meughen alle schepen daer in vrijelick verwinteren, als de nieuwe haven van Delfshaven. ten tweeden dobbel houwers deur het zeestrandt schuerende en brengen geen saendt ande havendorpel gelyck de rivieren wel doen; volcht den besloten dobbel houwer heeft alleenlick te schueren deur het strandt des ouvers, om dat open te houden, daer de rivieren noch bovendien moeten overwinnen het sandt datse selfs overvloedelick afbrengen, en ten eynde van crancke sandt stroom op de havendorpels laten vallen. ten derden soudemen deene syde des dobbelhouwers met haer sluyse moghen gebruycken tot incommende schepen, dander tot uutvarende sonder malkanderen te ontmoeten, ten vierden souder in den sluyt een somer lanck wat te vermaken valt mach men daerentusschen dander gebruycken. Hier teghen syn de rivieren gemaecte havens sonder kost, en de steden aen de Schelde, Maes en Rijn hebben t voordeel van dobbelhandel so wel verre te landewaert in als over zee.

Syn excellentie heeft door behulp van [rys/water]wercken te lynghen doen wech schueren veel hinderlicke berghen die eerst anden kant des grachts laghen daer nu veel roeden<sup>25</sup> plat landt is op weynich jaeren met kleyne kost; de stucken vielen so groot af dat de burgerye aldaer tselve met verwonderinghe dickwils quam besien.

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<sup>25</sup> In the printed text: '1000 voeten', *Waterschuyring*, p. 53.

[In margin: schepen in havens liggende maecken onder diepte]

Veel schepen in een haven liggende beletten oock de schueringh, ende men bevint datter onder de schepen meerder diepte komt, dant te vooren was, en dat het water daer onder moet met meerder geweld, voornementlick alse gelaen syn. Daerom machmense hier nevens malcander doen legghen, of daermen meerder diepte begeert machmense niet deen achter dander legghen, maer nevens malkanderen.

[In margin: Duynen hoe sij sus of so groeyen]

Eermen de Zype bedyckte so vergaerde het sandt lanckx de zeeoever met kleyne heuvelkens, maer wantse niey hoogh genouch en waeren, het water der grote nootweste stormen isser somwijlen overgelopen, heeftse wechgespoelt<sup>26</sup> ende tsant verre achterwaerts op de gorsinghe gespoelt,<sup>27</sup> sulckx datse ten dele daer af bedeckt wiert deur [...] maer den dyck daer na geleydt synde ende het hoogwater der stormen daer niet deur noch overloepende, ten conde het sandt niet verschueren, dan vergaende deur de stercke drooghe winden voor den dyck tot hooghe duynen maer so tselfde landt onbedyckt gebleven waer, daer hadde tot te verwachten geweest datter mettertyt van selfs breede duynen souden gecommen hebben, van achter alenckx anwassende tot ande strandt toe al daer hoogher wordende gelyck voor hollant vander Heyde af tot Pette toe gestelt is, al waer sulcke dyckage niet en had gedaen geweest. Also lichter oock eenen dyck lanckx de vlaemsche zee kant achter de duynen de welcke sijn lanck en smal, sonder dyck en soudense so kort en hoogh niet hebben konnen vergaren sonder met groote stormen wech te schueren

*Folio 208 verso*

Doorsake dat veel persinghen [gorsinghe]<sup>28</sup> langs sandighe zeestranden met geen sandt bedeckt en worden, is dat tot sulcke plaetsen het sandt cort syde en de diepte der see by wesende alle getye onder water komt en daerom nat blijft sonder gelyck het droogh tot stuyvingh te geraken ende ophooghinge.

[In margin: kisten voor dantsick doen goet]

noch te segghen vande kisten te danzick. warensier niet daer souden eylanden wassen. Sy syn oorsaek van goe diepte. Daer vergaert een eylant op den santrinck, tsal metter tyt uyten water steken. Hoofden veroorsaken eenen rinck anders groote rivieren loopende deur verscheyden killen maken elck wel syn manier van rinck, die in malcander commen maer en syn so merckelick niet als wanneert al deur<sup>29</sup> een kille loopt.

Ick moet te Middelborgh vernemen hoe breed en diep de sluysen daer altemael tsamen syn die in de havens schueren. S gelyckx t' Amsterdam, te Delfshaven, te Rotterdam, te Goeree. Hoe wyt ligghen de twee dycken van malcander vande haven ten Middelborgh. Ick moet inde haven te Middelborgh op leegh water meten de schoenheyt der syden vande kiel der havens, oock te Vlissinghen. Ick moet vrighen na de grootheyt en gestalt van t gat der sluys te duynkercke.<sup>30</sup>

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<sup>26</sup> In the printed text by H. Stevin: 'wechgeschuert'.

<sup>27</sup> In the printed text by H. Stevin: 'wechgeschuert'.

<sup>28</sup> In the printed text: 'gorsingen'. Waterschuyring p. 54. In the context this is more logical. Beeckman may have misread this part of Stevin's text.

<sup>29</sup> De Waard transcribed 'daer'.

<sup>30</sup> For a detailed edition of Waterschuyring with various later additions see H. Stevin, 'Wisconstich Filosofisch Bedryf', in *The Principal Works of Simon Stevin*, vol. v.

# Appendix B

## Hendrick Stevin: Eenighe stucken der Crychconst beschreven deur Simon Stevin

The Hague, Koninklijke Bibliotheek. 128-A-9-11

EENIGHE STUCKEN DER CRYCHCONST Beschreven deur SIMON STEVIN  
In sijn leven Quartiermeester General en Ingenieur vant leger mitsgaders Superintendent Raet en Reekenmeester vande Domeinen van Prince Maurits Hoochlofficker Gedachtenis

*Folio 1 verso*

Al hoewel de oirdening der steden niet en is gehoorende tot dese Crijchconst, maer totten huijsbou; soo schijnt dit haer behoorlicke plaets niet: Doch gemerckt daer in vervadt is het besonder gevoelen van mijn Vader Za: angaende de saeck der oirdening en versterckinge van Steden en Schansen, namelick dat groote en kleijne Steden en Schansen daert de gelegentheit der plaets daermen die leggen wil toelaet, om sulcke redenen als int volgende tsijnder plaets geseijt sal worden, al behooren veroirdent te worden rechthouckich<sup>31</sup> viercant, en nochtans sterck tegen t gemeen gevoelen der hedendaechschen Stercktenboumeesters; Daer van ick de meijning (alsoo ick de volcommen beschrijvinge diens angaende van mijn Vader Za: niet gevonden en heb) Int leste deser Stedenoordening deur Eenige formen [*de meijning' deleted*] eenichsins verclaert hebbe. Ick heb hier noch bijgevoucht als Voorslach van mijn Vader Za: Angaende de gracht der Schans te Berck, mitsgaders een voorslach des selves angaende tleggen der watermolen binnen de Stadt Linghen, Die ick onder eenige andere \* vonden [*in margin: \* Inventien*] tot dienst der Steden Dantsich, Calis, Elbing en anderen ghevonden hebbe.

*Folio 2 recto*

VANDE OIRDENING DER STEDEN

Cort begrijp.

Angesien uijt vergaring van veel huijsen, Steden commen die wel veroirdent sijnde tot groote bequamheijt en gerief der huijsen strecken, soo is de oirdening der steden stof totten huijsbou' gehoorende, daerom sal icker af seggen als volcht.,

Ten 1 en vande middelen daermen groote machtige Steden door maken can.,  
Ten 2 en vande verkiesing der plaetsen daermen de Steden wil leggen.,  
Ten 3 en vande form der Steden.,

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<sup>31</sup> E. Taverne, 'Architecturae', (1984), p. 443, erroneously suggests 'achthouckich'.

Ten 4 en hoemen om tverdrincken der Steden en Dorpen te voorkomen, bedijckte landen doet hooger wassen, die daer me oock veel vruchtbaerder zijn.,  
Ten 5 en hoemen twater van stilstaende stinckende grachten can ververschen.

*Folio 2 verso*

[blanco]

*Folio 3 recto*

I. VANDE MIDDELEN DAERMEN GROOTE MACHTIGE STEDEN DOOR MAKEN CAN

Ick segh dat een seer machtich Vorst, voornemen hebbende van de beste Stadt te maecken diet hem mogelijk is, brengt daerin het Vorstelick hoff met alle de opperste Raetcamers of vergaringen \* [in margin: Collegien van sijn regering, gelijk van Staet, Recht, Reeckening, Zeesaken\* [in margin: Admiraliteyt], Chrijch, Munte, kercken etz; welcke alsoo bij den anderen sijnde, strecken benevens de grootmaecking van Steden, noch tot meerder gerieff inde regering, om de redenen vandien<sup>32</sup> breeder verhaelt int [...] <sup>33</sup> hoofstick. Noch soude ick daer in brengen het Oppersteschool \* [in margin: Academia]; Oock hantwercken, voornamelick weverijen van dingen die verre en na seer gesleten werden; Sgelijcx Visscherije en Scheepbou; bovendien (dat de Steden aldermeest verbeterd) de Coomschap met verscheen uijtlandsche Cooplien, die daer wonen en hun handel drijven. T is wel waer dat alle dese voorschreven<sup>34</sup> dingen in een Stadt te brengen, tot sommige plaetsen niet geschien en mach, om dat verscheijden Steden met ijēt besonderlijcx \* Gheeiigenwetticht [in margin: Geprivilegeert] sijn, en hemlien niet en mach ontrocken worden, doch cant in eenige landen anders vallen, en mach het wit blijven, vande saecke<sup>35</sup> soo na te commen als doenelick is.

Angaende sommige van gevoelen sijn, de grootste Steden niet de bequamste te wesen, om daer in een vreesaem wellustich leven te leijden,<sup>36</sup> maer wel de middelbare, onder welke Aristoteles [in margin: Bij Aristote: noch te seggen vande grootste steden als Ninive, Babilon, Alcaire Chyna; etz.] meent dat [...] <sup>37</sup> burgers een bequame menichte is; men soude als men de omstandigheden overleijde, anders daer af mogen oirdeelen, insiende Eerstelick dat in sulcken Stadt overvloed is van alle dingen der werelts, soo wel dieder de natuer des lants niet voorts en brengt, als dieder

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<sup>32</sup> In the printed text: 'die daer af'.

<sup>33</sup> In the printed version H. Stevin added: 'verhaelt sullen worden int laest vant eerste Hooftstick van der Raden oirden, 't welck is het volgende 3 Onderscheyt'. Thus he incorporated a topic discussed in one chapter of *Huysbou* in a different section of *Materiae Politicae*.

<sup>34</sup> In the printed text: 'verscheyden'.

<sup>35</sup> In the printed text: 'van de sake'.

<sup>36</sup> In the printed text: 'lyden'.

<sup>37</sup> In the printed text Hendrick Stevin added the words 'seker getal', a certain number.

*Folio 3 verso*

wassen, en dickwils seer goeden coop: Men hoort in sulcke Steden watter over al inde werelt ommeget, ja de vreemdigheden des Werelts vergaren daer. Die ten hove off in eenige der opperste Raetcamers te doen hebben, enbehouven niet verre te reijsen. Die hun inde bouckstaven \* [in margin: Letteren] willen oeffenen, hebben het hooch School bijder hant, dat oock bequaem is voor Burgers die hun kinderen daer in willen optrecken, sonder die tot groote cost bijtens slants te moeten senden, oock oorsaeck wesende van veel geleerden diemen in sulcken Stadt crijcht: Voort die ijct constelick wil gemaect hebben, of selff leeren maecken of zijn kinderen doen leeren, heeft menichte van constenaers al gereet, want na het spreekwoort daer het aes is vergaren de vogelen. – Angaende geacht wort dat meuterien inde seer groote Steden, om de groote menichte des Volcx dickwilsder vallen dan inde cleene, dat en schijnt niet vast te gaen: Het can wel gebeuren datse vande<sup>38</sup> cleene niet soo vermaert en sijn, noch soo eijgentlick beschreven en worden, maer dickwils sijnse voorde inwoonders ghedueriger en veel beswaerlicker. Tot voorbeelt van desen [...] In somme<sup>39</sup> t' mach den eenen hier den anderen daer beter gelucken, maer int gemeen geseijt, het angenaemste beste leven schijnt inde grootste, meest bewoonde rijckste ende machtichste Steden, daer ghedeurige vermeerdering afgeschiet, en noch verwacht wort. En met insicht van sulcke gedeurige oirdenticke vermeerdering sal ick deser Steden oirdeningh beschrijven.

Daer volcht nu te seggen,<sup>40</sup>

2.<sup>41</sup> VANDE VERKIESING DER PLAETSSEN<sup>42</sup> DAERMEN DE STEDEN WIL LEGGEN

't welck sijn meeste gebruijck schijnt te hebben in nieuw

*Folio 4 recto*

gevonden landen, daer ghemeenten hun willen neersetten, alwaer tgeschil sijnde wat plaets men daer toe nemen sal, soo sietmen int gemeen geseijt na een vruchtbare gront, gelegen bijde mont van een groote bevaerlijcke rivier, commende uijt verre landen, Want sulcke plaetsen dobbel vaert connen crijgen, d'eeene in Zee dander te landewaert in. Voort soo het gewas en hantwercken der Ingesetenen van sulcke wijstreckende landen over de werelt soude verspreijt worden, het moet al deur dien mont. Sgelijcks alle overzeesche goeden die sulcke landen behouwen, moeten sij al deur desen mont crijgen, veroirsaeckende grooten handel en verbontenis van d'een met d'ander, oock groot incommen van tollen en schattingen die de deurvarende goeden betalen moeten. Van sulcke gelegentheit is Egipten anden mont vande Nilus, daer eertijts een selsaem rijckdom geweest, ende nu noch soude cunnen sijn, ten ware hun heer den grooten Turck dat selfs (soomen seyt) verhindert, van sulcke gelegentheit is hollant anden mont vanden Rhijn en Mase, wesende twee groote bevaerlicke rivieren, commende uijt verre wel bewoonde landen, twelck tot voorbeelt can verstrecken vantgeen vooren geseijt is; want de rijckdom en tvermogen uijt sulcke gelegentheit veroirsaeckt, seer seltsaem is, ghemerckt

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<sup>38</sup> In the printed text: 'van'.

<sup>39</sup> Deleted: 'ge'.

<sup>40</sup> The word 'int' follows in the printed version.

<sup>41</sup> Inserted in the printed version: 'Hooftstic'.

<sup>42</sup> In the printed text: 'plaets'.

soodanigen dobbelvaert als hollant heeft nu op den Eertbodem niet bevonden en wort, noch oirdelende na nateurliche redenen in menschens leven niet commen en can, want hoewel de Donau in Europa, den Nilus in Affrica, Ganges in Asia, Roo Damasones in America & meer ander veel grooter sijn, dan den Rhijn, soo souder te veel tijts behouven, om de middelen op te rechten dieder toe noodich sijn: als onder anderen hoe soudet ergens meugelick wesen op corten tijt te krijgen over de hondert duijsent

*Folio 4 verso*

cloucke ingesetenen, seevarende mannen, gelijkcker in hollant op een cleene plaets bij den anderen bevonden worden; hoe souder ergens op cortentijt een sulcken machtigen gesetten handel connen gemaect worden, tusschen het landt ande Riviermont ende de landen ande rivieren gelegen, gelyckter is tusschen Hollant ende de wijtstreckende landen gelegen anden Rhijn en Mase met ander bevaerlicke rivieren daerin commende; hoe souder in corten tijt sulcken visscherije op te rechten sijn alser in hollant is, alwaer sonder d'ander Visscherijen over de [...] duijsent buijsen alleen op den harinck varen, die al de werelt deur gesleten wort. Sulcx dattet<sup>43</sup> schijnt vast te gaen tgeene geseijt is, teweten datter een lange tijt soude behouven omsulcken dobbelvaert alser in hollant is, metter daet elders te krijgen, waer bij men verstaen mach het voordeel datter uijt sulcke gelegentheijt van landt te halen is, want Seehavens als van Marseille, Genua, Napels en diergelijcke sonder bevaerlicke rivieren, tgeene daer comt en can te landewaert in niet verbreyt worden, of soo weijnich dattet niet te bedien enheeft, maer moeten de goeden weerom in Zee, tot plaetsen daer ijgelick sijn goeden brengen mach.

3.<sup>44</sup> vande form der steden

Ghelijck de leering in krijchandel van het logieren, naerderen, en veltslach, daer elders breeder afgeseijt is, bequamelick aengevangen wort met voorbeelden op platte velden, omdat

*Folio 5 recto*

de form vandien eenvoudich sijnde, de leering, daer op gegront, dienen can voor gemeen regel, uijt welcke getrocken wort tgeene men tot sijn meeste voordeel doen mach opde landen met bergen, dalen, bosschen, rivieren en marassen diens formen van oneijndelicke verscheijdenheden sijn, alsoo houde ick oock, om deselve redenen, de leering van het oirdenen der Steden bequamelick an te vangen met voorbeelden op platte velden, en dienvolgens seg ick aldus. De viersijdege rechthouck op een plat even landt is mijns bedunckens der Steden bequamste form, om daer in te krijgen geschickte rechthouckige blocken, erven, huijsen, hoven, merckten, en plaetsen, welcke in ander formen soo niet vallen en connen; want vijfhouckige en veelhouckige steden, al sijne int \* [in margin: *circolo circumscriptibilis*] ront beschrijvelick, met een oirdentlick merckt int midden, en straten van daer totte bolwercken, alles met lijcksijddiger gestalt, soo vallen nochtans veel huijsen blocken en erven scheefhouckich, en opt een eijnde breeder als opt ander soomen sien mach in Palma [...] met meer ander Steden en Sterckten, alsoo nieu gebouwt. Angaende hier opgeseijt wort dat rechthoucken der Steden qua Streckte veroirsaken,

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<sup>43</sup> Deleted in the manuscript: 'tet'; but included in printed version.

<sup>44</sup> Inserted in printed text: 'Hoofstic'.

<sup>45</sup> In the printed text Hendrick Stevin included 'Coevooren' (Coevorden).

om dat de bolwercken daer commende scherp vallen; Ick segh daer tegen sulcx niet nodich te wesen; Maer recht te mogen sijn, wanneermen de Strijckweeren<sup>46</sup> der nevenstaende bolwercken noch eens soo lang maect als de Strijckweeren der rechthouckige bolwercken op de rechthoucken der Stadt commende. Volgens van sulck besluit, ick stel dese form eens Stadts van een viersijdich rechthouck, hebbende op elcken houck een rechthouckich bolwerck, en haer nevenstaende bolwerckens strijckweeren noch eens soo langh. Als bij voorbeelt het strijckweer A B, noch eens soo lanck als het strijckweer CD des bolwercx op den houck commende; Want daer me wort

*Folio 5 verso*

de voorsijde DE gestreecken van FA helft van AB, soo lanck sijnde als het heele Strijckweer CD daer van ick in de Stercktebou eigentlicker seggen sal. In dese Stadt neem ick de straten over al breed 60 voeten, mits welverstaende, datter over elcke zijde voor de hujsen comme een galerije<sup>47</sup> van 10 voeten breed, om menschen in te gaen sonder wagens of paerden, en commende dese straten eijntlick al uijt op bolwercken en middels van Gordinen van welck gerief gesijt is int [...] hoofstick,<sup>48</sup> sulcx datter tusschen de twee galerijen open straet blijft van 40 voeten, voor paerden en wagens. Totte blocken der hujsen sijn genomen viercanten elcke sijde van 360 voeten, twelck ick in groote steden voor bequame langde houde om twee erven van hujsen ruggeling teghen malcander te commen daer af de redenen eigentlicher verclaert sijn int [...] hoofstick,<sup>49</sup> Voort commen inde Stadt drie havens' elck breed 180 voeten,– De plaetsen met getalen geteijckent sijn als volcht,<sup>50</sup>

- 1 De groote marckt.
- 2 De Coornmarckt.
- 3 De houtmarckt.
- 4 De beurse.
- 5 De Steenmarckt.
- 6 De beestenmarckt.
- 7, 8, 9, 10, 11. vijf kercken daer af 7 de groote is.
- 12 Vorstelick hujs of hoff.
- 13 het stadthuijs.
- 14 Vangenis.
- 15 Tuchthuijs.
- 16 Vleeschuijs.

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<sup>46</sup> The printed version contains a marginal note with the word 'flanken'.

<sup>47</sup> In the printed text: 'Loove'.

<sup>48</sup> In the printed text: 'gesijt is int [...] hoofstick' is replaced by 'elders geseyt is'.

<sup>49</sup> In the printed text: 'der Huysbou' is inserted after 'hoofstick'.

<sup>50</sup> In the printed version: 'De percken die eenige ghemeene plaetsen beduyden, sijn met woorden angewesen' (the compartments representing specific functions are indicated by name on the map). The passage follows with 'L,M,N,O, sijn uytheemsche Cooplien huysen. Onder P wort angewesen een der blocken met manier van verdeeling dieder valt inde groote menichte der Burgerlicke huysen. Welcke verdeeling oock gedaen can worden na de manier die int volgende 5 Hoofstick verclaert sal worden'.



*Folio 6 recto*

[Illustration]

[Plan: Town, numbers referring to public buildings on former folio]

*Folio 6 verso*

[blanco]

*Folio 7 recto*

17 Vischuijs

18 hoochschool

19 het Armenhuijs

20, 21, 22, 23, Uuijtheemsche Cooplien huijsen,

24, 25 Caden

26, een der blocken met manier van verdeeling gelijcker valt inde groote menichte der Burgerlicke huijsen<sup>51</sup>

Om nu wat breeder verclaring te doen vande voorschreven verdeeling, soo is de groote marckt geteijckent i ontrent het middel vande Stadt na t'behooren, inde selve ist gerievich vercocht te worden alle versche eetelicke waren, die de Ingesetenen dagelicx behouven, als vleesch, visch, ghevogelte, suijvel, groente, en fruijt, om niet te moeten gaen tot verscheijden plaetsen verre van malcander gelegen, daerom is oock hier<sup>52</sup> ande selve marckt veroirdent het vleeshuijs geteijckent 16 het Vischuijs of vischmerckt 17 staende bequamelick ande watercant. Angaende gevoghelte suijvel groente en cruijt<sup>53</sup> wesende dingen die de lantlien dagelicx versch brengen, de selve staen gemeenelick opt marck velt, elck op sijn oirt en behouven in groote Steden groote plaets, want bij tgevogelte dienen na tgebruijck van veel steden te staen eijeren, hasen, coninen, braetverckens, worsten, beulingen, pensen, Onder suijvel verstaet men, melck, room, versche caes en botter, onder groente dient warmoes, salaet, cancommers,<sup>54</sup> colen, peen, bloemen, wel rieckende kruiden, mette zaden vandien,—

D'ander marckten geteijckent 2, 3, 5, 6, (te weten Coornmarckt, houtmarckt, Steenmarckt en beestemarckt)

*Folio 7 verso*

liggen elck int middel tusschen twee rivieren bequam tot aenvoering der goeden. De burse 4 mette uijtheemsche Cooplien \* [in margin: natiehuijsen] huijsen geteijckent 20, 21, 22, 22, 23 sijn ontrent het middel der Stadt. De groote kercke 7 is oock ontrent het middel der stadt, en dander vier geteijckent 8, 9, 10, 11 staen soo verdeelt, datter geen Burgerije verre van een kercke en is,

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<sup>51</sup> The printed version contains an additional sentence: 'welcke verdeeling oock gedaen can worden na de manier die int volghende 5 Hoofstick verclaert sal worden'.

<sup>52</sup> The word 'oock' is separated from 'hier' in the ms.; the printed text reads 'hier oock'.

<sup>53</sup> The printed version omits the words 'en cruijt'.

<sup>54</sup> In the printed version: 'concommers'.

<sup>55</sup> In the printed text: '-en' instead of 'sloten'.

Angaende het Vorstelick huijs 12, van zijn behoorlicke plaets is bij eenige verscheen gevoelen, sommige willen dattet sij een besonder slodt of sterckte, met wallen en grachten tendeele bujten de stadt uijtsteekende, om tegen alle onverhoede swaricheden den Vorst daer in verseeckerder te zijn, de Stadt in sijn dwanck te houden, en de qua na sijn wille te straffen. Ander achten sulcx wel te dienen voor een wreetaerdich Vorst, of anders voor een diens regering niet vast genouch staende sijn ondersaten vreest, maer sulcx niet wesende dat hij sijn hoff behoort te houden int middel vande Stadt, om bujten alle quaet vermoen wel bemint te sijn, ende de stadt seer te mogen verbeteren, want Cooplien voornamelick de uijtlandsche daer groote rijckdom af comt en wagen hun welvaren niet geeven in steden met sloten<sup>55</sup> die vant Crijchsvolck bewaert worden.

Tusschen dese twee heeft mij tot voorbeelt eens middelwech bevallen, te weten geen uijtssteekende Slodt met wallen en grachten tegen de stadt, noch oock soo teenemael int middel der Stadt, dat de Vorst niet daer bujten en soude connen trecken, zonder telckens deur de Stadt te gaen, ende vande gemeente ghesien te wesen, maer ande stadtswallen met sijn eigen uijtganck of poorte tusschen twee bolwercken int middel der gordine. hier vooren is geseijt dat, willende een Vorst de beste Stadt maecken, diet hem mogelick is, daer in brengt het

*Folio 8 recto*

Vorstelick hoff met alle de opperste raetcamers van sijn regering: Wijder seg ick nu dat mij die niet alleen bevallen en souden in een Stadt, maer soudese oock al bij malcander begeeven in een gesticht om redenen naerder verclaert int [...] hoofdstick,<sup>56</sup>

Volgens welcke meijninge de selve verstaen worden altemael in dit Vorstelick hoff begreepen te wesen, die daerom op geen ander plaetsen veroirdent en zijn.,– Het Stadthuijs 13 is oock ontrent het middel der Stadt met Vangenis 14 en tuchthuijs 15 daer nevens.

Bij het hoochschool 18 verstaen ick te gehooren de Stadtschool, oock de schermeschool en Schotterdoelen daermen de Crijchandel leert, als schieten met hantroers, bussen,– musquetten en grofgeschut, maer sonder hantbogen oft Cruijsbogen die nu inden Crijch geen gebruijck en hebben;

Voort de Ruijterconst vervougende alsoo de leeringen bij malcander sulcx dat dese altsamen een groot gesticht souden maecken., In het Armhuijs 19 soude ick bij een vergaren, al tgeene in ander steden tot verscheijden plaetsen veroirdent is: als Outmannenhuijs, Sieckhuijs, Lasarushuijs, blindelienhuijs, Schamelweeshuijs, Gasthuijs, Vondelinghuijs, Outvrouwenhuijs, Pesthuijs, Pockhuijs, Dulhuijs met dieder meer sijn: En over al de regierders van welcke een gemeen opsiender wesende, soo soude dit oock een geschickt groot gesticht connen vallen., Int viercant onder 26 wort angewesen de manier der verdeeling eens blocx in gemeene burgerlicke erven,<sup>57</sup> om die uijt te deelen of vercoppen elck na sijn behoefte.

D'ander groote menichte van ongetalde<sup>58</sup> viercante percken sijn blocken tot huijsen der gemeente en andere nodige gestichten.,

*Folio 8 verso*

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<sup>56</sup> The printed version reads 'verclaert by 't laest vant 1 Hoofstuck des volgende derde Onder-scheyts'.

<sup>57</sup> In the printed text: 'burgerlicke huysen of erven'.

<sup>58</sup> In the printed text: 'ongetalde' is omitted.

Over de havens soude ick veel bruggen begeeren, als an elcke straet daer op uytcomende een brugge.<sup>59</sup>

De poorten sullen commen tusschen twee bolwercken int middel der gordinen, in menichte soo veel datter van twee tot twee bolwercken commen van poorten.,  
De loosing vant regenwater dient int begin oock bedocht en de Straten totte afwatering bequamelick veroirdent.

Tot sommige plaetsen legt men een goote int middel der straet. Elders twee gooten op elke sijde langs de huijsen een, wesende de Straet int middel hoogst:

Noch isser een derde beste wijze te weten een overwelfde \* [in margin: Rioler] waterloop int middel onder de straet drie ofte vier voeten hooch, en oock soo breed met overwelfde sijdling gootkens commende van voor de huijsen tot in de waterloop in welcke het water comt deur ijser tralien of platen met gaten, soo cleen datter geen groote steenen, hout ofte ander dingen in en commen die stopping veroirsaken; met dese overwelfde waterlopen en heeft men niet sulcken verstopping, vergaring van slijck op de Straten, noch stanx gelijk met d'ander. In Steden die van binnen geen rivieren noch grachten en hebben doet men het regenwater loopen deur de poorten in de Stadsvesten.

In dese form sijn overal lange rechte straten geteijckent: En hoewel an sommige de cromme gevallen, achtende vermaeckelick te sijn, dat men al voortgaende telckens verandering van gestichten siet, soo mocht men daer op antwoorden ten eersten dat veel schoone gestichten t'seffens te sien angenamer int gesicht gelaet dan weijnich. Ten anderen dat cromme Straten ongeschickte form van huijsen en erven veroirsaecken. Laet tot verclaring vandien A B in dese eerste form een cromme Straet wesen, waer in de erven onderscheijden sijn met rechte ewewijdige linien,—

*Folio 9 recto*

als CD, EFGH, Twelck soo sijnde, het voorhuijs an straet commende heeft deen houck DCE plomp en d'ander CEF scherp, van ongeschickte form, onbequam om daer in te stellen viercante tafels, bedsteen, cassen en diergelijcke., Maer bij aldienmen de linien niet en treckt evenwijdich, dan soo dat de voorhuijsen ande Straet sijde twee evenhoucken krijgen, gelijk in dese tweede form,<sup>60</sup> soo vallen

[Illustration]

sommige erven en camers achter wijder ettelicke achter nauwer dan vooren twelck oock onbequame formen sijn, sulckx datmen de rechte straten bij gemeene regel voor best houden mach. De teijckening der Stadt van Straten en blocken opt landt gedaen sijnde, zoo ist oirboir over het toecommende gebou, keuren te maecken, die afte leesen, en met geplacke brieven int openbaer brengen *met insicht van t' vermogen der gemeente die bouwen sal en na den eijch van alle omstandigheden die af te lesen.* Als dat niemant hem en vervorderen

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<sup>59</sup> In the printed version the words 'gelijk hier angewesen wort' is added here and all the streets are indeed connected by bridges in the printed illustration of the city, in contrast with that in the manuscript. This was probably Hendrick Stevin's addition.

<sup>60</sup> In the printed text: 'gelijk in d'ander nevenstaende form'.

Folio 9 verso

te bouwen over de geteijkende of angewesen linien, op verbeurte van dat weerom af te breeken en te betalen de breuck daer toe gestelt. De voorgevels der huijsen langs de straet te moeten comen in rechte linie dieder angewesen is. Tegen brant niet dan hart dack te mogen leggen. Ten selven eijnde elck huijs sijn pompte te moeten hebben. Elck huijs ande straetsijde twee viercanten hooch te moeten sijn. Elck huijs sijn kelder te moeten hebben. Die willen, sulen zijdmueren van haer nabuijren meugen gebruijcken mits betalende t'geen sij met malcander verdragen, of anders<sup>61</sup> niet commende alsdan [tussengevoegd], na datter sal gewesen worden van sulcke andere alsmen oirboir verstaen sal. Oock ist nodich Amptlien te belasten<sup>62</sup> van op de gestelde oirden des gebous acht te nemen, en de overtreders scherpelick te bekeuren, want anders valter na goede teijckening een onoirdentlick gebou, twelck daer na niet sonder swaricheijt en souden connen verandert worden, om de groote verlooren costen dieder vallen moeten.

VAN LOOVEN VOORDE HUIJSEN OP BEIJDEN SIJDEN DER STRATEN.

Het is te weten datse groot gerijf geven, want vooral de huijsen van een Straet wel oirdentlick gemaect sijnde, gelijk, in sommige plaetsen gebeurt, men can al de stadt deur gaen, buijten regen, buijten slijck, onverhindert van wagens en paerden, die over de straet tusschen beijde de looven deur rijden: Als de Son heet schijnt

*Folio 10 recto*

soo canmen op deen of d'ander sijde inde coele schaeuwe gaen. Al twelck niet alleen en sijn angename dingen voor de rijcke maer oock tot voordeel der Armen, die den cost moeten winnen al gaende langs de straten, wiens cleeren eens doorregent sijnde tottet lijf toe geen ander drooge en hebben om an te trekken, diens coussen en schoen inde modder haest verslijten en gedeurlick mett natte voeten gaen, veroirsaeckende veel sieckten die daer uijt volgen,- welcke smettelick sijnde van hemlien totte rijcke wel geraecken, daerom als de rijcke het bouwen van sulcke looven int gemeen helpen voorstaen, zij souden hun eijgen saecke oock bevorderen.,- De form dier loven met haer goten<sup>63</sup> daer int [...] hoofstlick breeder afgeschreven is sijn als hier onder<sup>64</sup>

[Illustration]

*VANDE LYCKSYDIGHE*

Vergrooting der Stadt.,

De voorgaende Stadt is teenemael, soo inwendich als uijtwendich van lijckzijdige form. Maer want in welvarende Steden dickwils vergrooting geschiet; het welck alser niet opverdocht en waer met onoirdent

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<sup>61</sup> Here 'alsdan' is deleted; in the printed text: 'alleen anders'.

<sup>62</sup> In the printed text: 'te veroirdenen en die te belasten'.

<sup>63</sup> Inserted: 'met haar goten'.

<sup>64</sup> In the printed text: 'H:S: De Form deser Looven is beschreven inden Huysbou'.

*Folio 10 verso*

liche onlijksijdicheijt mocht toegaen, deur voorsteden, speelhuijsen en andere gestichten, diemenbuijten de Stadt boude en niet sonder groote scha en swaricheijt en souden connen afgebroocken worden, om met een lijckzijdige oirdening te vergrooten, soo machmen om daer tegen te voorsien aan beijde de smalste eijnden der Stadt teijckenen sulcke straten en blocken, gelijk inde Stadt, soo de getippelde linien buijten de stadt anwijsen, vercoopende alleenelick de blocken om elck die te besaijen of betimmeren na zijn wille en dat tot desen eijnde: Beslooten wesende de Stadt te vergrooten, men zal dat doen ande voorschreven twee smalste einden, worpene wallen en bolwercken in de grachten GH, IK, daer sij uijtgecommen zijn, en maken de vergrootingh an elcke sijde evenveel, op dattet geene nu t'middel is, het middel mach blijven, soo wel om het boveschreven gemeen gerief, en op dat degeene die haer huijsen en erven daer hebben tot geen scha en commen wannermen anders deede, als om de lijcksijdicheijtswille. En want de voorschreven getippelde straten buijten de stadt onbebout sijn bleven, soo sal daer me voorcommen sijn de swaricheijt van huijsen of gestichten af te moeten breecken, omlijck-sijdelick te bouwen. Angaende nu ijemant seggen mocht, dat de stadt hier me seer sal verlangen sonder verbreden: hier op antwoorde ick mijn meijninge niet te wesen tot verbreding te commen, al soudese thienmael of meermael langer worden dan breet om dese reden: Wanneer het middel of Marckt der uijtermaten groote Steden verre van eenige stadtpoorten is, soo vallet beswaerlick, voorde gheene die daer dagelick van buijten moeten brengen versche cruijden, fruijten, en ander leeftocht; oock voorde Ingesetens die dickwils buijten de Stadt gaen in hun tuijnen en speelhuijsen, oft die

*Folio 11 recto*

int groen willen gaen wandelen, om hunlien te vermaecken: Al twelck voorcommen wort met groote Steden te veroirdenen die niet te breet ensijn, als deese hebbende inde breedte binnenswals 5820 voeten, daer af men de 20000 reeckent op een uijer gaens, sulcx dat men over al ten hoogsten maer den helft vandien te weten 2910 voeten vande wallen en is., Doch soot een Stadt waer gelijk Babilon was, drie dach reijsens lanck, en datmen om al te groote lengde te schouwen oirboir verstonde sijdeling waert te vergrooten, soo soudemen dat meugen doen met uijtsteecksels Cruijswijs opde lange stadt commende, soo breet en in sulcken [*'form' deleted*] oirden als de voorgaende, gelijk bij voorbeelt met dese nevenstaende<sup>65</sup> form angeweesen wort, waer mede

[Illustration]

men over alsoo na soude sijn om buijten de Stadt te commen, en alle toevoering gerievelick te hebben als vooren,—

*Folio 11 verso*

Tot hier toe geseijt zijnde van de form der grootste steden, soo sal icker noch wat bij vougen vande cleenste, daermen schansen onder reekenen mach, Laet tot dien eijnde ABCD een viercante schans beteijskenen daer in staende vier rijen hutten E,F,G,H, nevens malcander met

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<sup>65</sup> In the printed text, 'nevenstaende' is omitted.

straten tusschen beijden al even breed, gelijk tot sommige plaetsen gedaen wort. Maer om nu te verthoonen de oirdening van hutten die mij beter bevaldt, soo stel ick hier nevens de teijckening van een ander viercante schans IKLM

[Illustration]

hebbende elcke sijde binnens ware vande selve langde als dander, daerin oock staende vier rijen hutten NOPQ, elck soo lanck en breed als de vier rijen in d'eerste form; maer anders vervoucht, te weten soo, datter int middel blijft een groot viercant leedich perck, daermen in comt deur vier deuren, int middel van elcke rijs, welck perck mette storm plaets even soo groot moet wesen als de leedige plaetsen van dander schans ABCD. Dit soo zijnde, ick seg mij de laetste oirdening beter te bevallen dan d'eerste, om redenen dat angesien elcke schans evenveel huijsing en oock

*Folio 12 recto*

evenveel leedige plaets heeft, so schijnt de groote ledige plaets of viercante ruijmt der schans IKLM, gherieviger voor Soldaten of inwoonders, dan de verscheidjen cleender plaetsen, of straten van d'ander schans.

4. HOEMEN OM TVERDRINCKEN DER STEDEN EN DORPEN TE VOORCOMMEN BEDIJCKTE LANDEN DOET HOOGER WASSEN DIE DAER ME OOCK VEEL VRUCHTBAERDER WORDEN

Angesien ick hier ben inde stof van oirdeninghen der Steden, en datter in veel bedijckte landen swaricheyt valt van steden, dorpen en woningen die met haer landen verdrincken en wech spoelen: Twelck can voorcommen worden deur bedijckte landen te doen hooger wassen, die daer me oock groote vruchtbaerheijt krijgen, soo en sal niet buijten wege sijn, daer af hier vermaen te doen.,

Int 13e voorstel des Eertcloots stofroersel is verclaert d'oorsaek waerom het water der Rivieren hoe langer hoe hooger comt: En geseijt t'selve oirsaeck te wesen datmen daer na in bedijckte landen watermolens moet gebruijcken die int begin der Dijcking onnodig waren (want de bedijckte landen na de bedijcking niet meer hoogende, gelijk wel doen het voorlandt ende buijtewater, soo moeder sulcx uijt volghen) oock wiert geseijt

*Folio 12 verso*

dat daerom sommige landen den dijk eens deurbreeckende daer naer geduerich onder water blijven, tot datse wederom hooch genouch gewassen sijn, waer uijt oock volcht het boveschreven verdrincken en wechspoelen van woningen, dorpen en steden daer in gelegen. Dit soudemen connen voorcommen met te volgen de maniere eertijts bij de d'Egiptenaeren gebruijckt die het hooch rivierwater vanden Nilus alle Jaer eens door de sluijsen inde bedijckte landen lieten comen, tot welcken einde de woningen op dijcken en hoochden gebout wierden, om daer af geen hinder te hebben: Dat hooch water weerom afgelopen sijnde, dedden de sluijsen toe tot dattet hooch water vant ander Jaer quam, om daerentusschen het saijen wassen en maijen der vruchten verseeckert te houden, tegen de ongeregelde hooge wateren dieder op mochten vallen: Daer na het oirdentlick hoochwater weerom comende, sij stelden de sluijsen open, lieten het lant andermael volcommen en weerom aflopen gelijk vooren.

Dit alsoo Jaerlicx onderhouden wesende, sij hadden daer me drie voornamelicke profijten: eerstelick alle Jaer een nieuwe mesting des lants, met overvloedige vruchten, en sonder braeck leggen, welck voordeel oock hier te lande sommige gewaer worden, die voorlanden hebben van sulcker gestalt datse met aprilsche vloeden onder water staen, en daer naer te seven Jaren naulicx eens met somer water als de vruchten opt velt staen overloopen en worden: Want soodanige eijgenaers, wagende te saijen en van vermogen sijnde een ongeluckich Jaer te verdragen, krijgen op dat Jaerlicx nieu gemest voorlant veel overvloediger en beter vruchten dan in de bedijckte landen, het tweede profijt was dat de bedijckte landen verhoogden al ofse onbedijckt waren geweest, sonder de voorschreven hindernis van

*Folio 13 recto*

waterlosingh onderworpen te sijn, en watermolens te moeten gebruijcken, en bovendien vrouger drooch te wesen. Ten derden sonder te staen in sulcken perijckel vanlant, Woningen Dorpen en Steden te verdrincken. Want een dijk schoon deurbroocken zijnde het lant en blijft daer naer niet leggen diep onder water, dan loopt weerom aff., Maer als men tgeene hier vande Egyptische maniere geseijt is, in dese landen wilde te werck stellen dat en soude voor eerst niet konnen geschien inde oude bedijckte landen daer Woningen Dorpen en Steden te leech gebout zijn, en onder water souden leggen als men de hooge vloeden daer in liete comen., In nieuwe Dijkkagien eenen alleen toecommende die sijn wille doet, of Dijkkagien daer verscheijden ingelanders condon over een comen, soudet een ander bescheijt hebben, want die souden woningen en Dorpen op de Dijkken en hoochden mogen bouwen, en de Inlating der hooge vloeden bevelen, en elck Ingeseten van die polder sijn reeckeninge daer op doen maecken. Noch staet te bemercken dat dese Jaerlicxe verhooging niet geschien en mach met zout zee water om dattet hinderlick is tottet gewas. Angaende een swaricheijt die hier mocht voorgewent worden: Dattet Aprils water niet comen mach op winter Coorn twelckmen hier in September saeijt, noch op wintergarst, raepiaet en meer andere die in April in d'eerde onder water souden liggen en bederven, hier op wort geantwoort: Datmen om daer tegen te voorsien, alleenelick te twee Jaren eens het water soude mogen inde polder laten saijende t'een Jaer winter vruchten t'ander Jaer somer vruchten, sulcx dat elcke mesting soude dienen voor twee Jaren. Belangende dan ijmant achten mocht daer me de verhooging des bedijckten lants minder souden sijn als vande

*Folio 13 verso*

voorlanden, te meer dat somersche en najaersche hooge vloeden daer niet op en comen waerme het voorschreven profijt soude vermindert sijn: Daer op dient tot antwoord: Datmen soodanige bedijckte landen op een selfde tijt zeerder kan doen anwassen, dan haer voorlanden twelck aldus toegaet: Genomen dattet water bij de sluijs of sluijsen ant hoochste eijnde der rivier, merkelick hooger sij dan bijde sluijs of sluijsen ant leechste eijnde der rivier, soo volcht hier uijt, dat de sluijsen ant hoochste eijnde geopent ende ant leechste eijnde gesloten, het water des heelen polders sal connen comen, ter hoochte der rivier ant hoochste eijnde, en ant leechste eijnde soo veel hooger als t'veral bedraecht. Daerom getoest zijnde tot dat de dickheijt des waters op de gront gesoncken is, en dan de sluijsen ant leech eijnt geopent, en het claer water afgetapt, den gront blijft voor datmael van soo veel verhoogt. Daer na de sluijsen weerom gesloten en het water des polders andermael wassende ter hoochde als vooren, en weerom getoets sijnde, tot dat de Dickheijt des waters op de gront gesoncken is, en dan de sluijsen aent leech eijnde weerom geopent, en het claer water afgetapt, den gront blijft voor de tweede mael van

soo veel verhoogt; En dergelijcke doende soo dickwils alst den tijt des hoogen vloets toelaet, men sal die bedijckte landen veel hooger doen wassen, dan op dien tijt haer voorlanden gewassen zijn. Doch staet te bedencken dat de boveschreven aftappinge niet en behoort te geschien ten tijde van storm, als de vette gront geroert zijnde, het water dick geworden is, wantmen daerme de stof die den anwas maectt verliesen soude,

*Folio 14 recto*

Merckt

Ick hebbe eenige die in Egipthen geweest zijn ondervraecht, of zij niet gageslagen en hadden, of hooren seggen hoet nu ter tijt daer mette voorschreven dingen toegaet, maer seijden datser niet op gelet en<sup>66</sup> noch af vernomen en hadden, oock hebben eenige, die daer t'schepe handelen, mij wel toegeseijt van dies bescheijt te doen weten, maer tot noch toe en ister niet af gecommen, soo ijmant dieder gelegentheijt toewet, sulcx vernemen conde, t mocht sijn datmen daer int uijt soude verstaen tot voordeel strecken.,

5. HOEMEN T'WATER VAN STILSTAENDE STINCKENDE GRACHTEN CAN VERVERSCHEN

[In margin: illustration]

Laet ABC een stilstaende stinckende gracht zijn, die an A eindicht sonder deurganck, gelijk in ettelicke Steden gebeurt., Om dese te ververschen, men sal de sijden an t'ende A bemueren, ter langde van 100 of 200 voeten, als van A tot B, en soo diep als men bequamelick can, halende het sandt of de stof tusschen beijden oock seer diep uijt, om daer in overvloedich quelmwater te krijgen, gelijk mette bornputten toegaet, daer na sal an B een reetschap gemaectt worden om het schoon quelmwater, dat inde diepe gracht AB comt, te brengen in d'ander vuijle gracht BC, diens water sal moeten wijcken en uijtloopen, daer het regenwater sijn losing heeft en versch water in die plaets commen.,

Tot hier toe is de mejning int rouwe verclaert, maer om

*Folio 14 verso*

nu van eenige omstandigen te seggen, soo is eerstelick te weten, dat men moet toesien, het water niet te diep uijt AB te trecken, ten eijnde het welsandt niet op en komme en ondiepte veroirsaken, maer het water op een seecker leeghde sijnde, soo moet men op houden en vertoeven tot dattet weerom opgecomen is.

Het soude voordelich sijn het eijnde grachts AB te overwelden, op datter geen vuijlicheijt in en vergaer, die ondiepte veroirsaeckt, en de opcomst des quelmwaters verhindert, welck overwelfsel gemaectt mach worden ter hoochde van d'ander nevenstaende straten, om daer op te mogen gaen.,

Deur tgeene hier geseijt is van een gracht in een Stadt, is oock te verstaen hoemen buijte grachten om de steden can ververschen, als bij voorbeelt in dese Statdt met haer grachten ABC, alwaer DEFG het bemuert grachtken betiejckent, en H de plaets der reetschap daermen twater me uijttreect.,

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<sup>66</sup> Hendrick Stevin writes 'gelet' and 'en' as one word. Since that makes the meaning unclear I have separated them here.



Om nu te seggen vande menichte des waters dien men op een uijer of meer can uijttrecken, ick neem een manscracht ande cruck eens reetschap ghedurich op 12 £, ende den keer op 4 stap, en des crux langde op en voet, comt elcke keer 12 £ waters 6 voet hooch,  
Dats elcke 4 stap 72 £, 1 voet hooch,  
Dats elcke 1 stap 18 £, 1 voet hooch;  
Dats op 8000 stap of op een uijer 144000 £, 1 voet hooch,  
hier af doen de 65 £ een voet;  
Dats op een uijer 2215 voet waters i voet hooch;

*Folio 15 recto*

Dats op een uijer een vuijle gracht breed 24 voet, diep 1 voet, lanck 92 voet;

Dats op een uijer een gracht breed 24 voet, diep 6 voet, lanck 15 voet;

Daerom soude een man in sulcken gracht, op tus uijeren of sdaechs brengen versch water 150 voeten langde des grachts, 6 voeten diep, en twater opgetrocken 1 voet hooch;

En daerom soude een man in sulcken gracht op 10 uijeren of sdaechs, brenghen versch water 75 voeten langde des grachts, twater opgetrocken 2 voet hooch; Waer uijt te reecken en is hoe veel meer mannen of peerden op een seker tijt souden connen ververschen.—

[Illustration]

*Folio 15 verso*

[Illustration]

*Folio 16 recto*

*Voorslach boemen de gracht der Schans te Berck bequamelick soude meugen diep houden sonder versanden oock sonder beeren te leggen.*<sup>67</sup>

De beek die nu loopt vande watermolen A na B tot C, salmen an B stoppen, en doen loopen rechtuijt van B tot D, van daer over beijden sijden om de schants deur de gracht, uijtcommende inden Rhijn an E. En de uytgegraven Eerde salmen an beijde sijden soo leggen, dattet hooch water inde beek niet en komme, voorsiende de twee houcken bij E wel met rijs,

Dit soo sijnde, daer soude alsdan noch meerder diepte inde beecke commen d'ander nu is, om datse vant hoochwatr met sant en cleij niet vervult en soude worden, en dattet water daer in soowel ten tijde van hoochwater als van leech altijt eenen wech soude loopen, uijtcommende an E. Sulcx dat daer gheen Rhijnwater in lopen en sall, en vervolgens gheen sandt noh cleij,

Maer soomen de kille van B tot E noch veel dieper wilde hebben, dat can aldus toegaen: Men sal opt stortebedde der watermolen bij A, maken een of twee optreckende sluijsdeuren,

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<sup>67</sup> Added by Hendrick Stevin to Vande oirdeningh der steden, but not meant for *Huysbou*. This passage was published in XI Boec van den Handel der Waterschuyring onses vaders Simon Stevin, *Wisconslich Filosofisch Bedryf*, pp. 73-74, *The Principal Works of Simon Stevin*, v, pp. 283-285.

waer me twater totten gronde toe wech can loopen, soo leege als het water voor de molen diep is, en maken daer me schuijring, soo dickwils als men oirboir verstaet. Twelck groote diepte soude maken, gelijk men van sulcke schuijring in Hollant en Zeelant veel voorbeelden heeft. Noch is te weten datmen de plaets goede versekerheit

*Folio 16 verso*

soude connen geven, met een borstweer te maecken vande opgeworpen eerde der beke, en dat over de sijde van D: Want tis daer voor te houden dat soo lang de<sup>68</sup> belegerde de schans hebben, soo lang de viant tusschen de Stadt en den Rhijn gheen leger te connen slaen, sulcx datmen achter dat borstweer vande Stadt totte schans sal meugen gaen en keeren om die te ontsetten.

Merckt noch datmen met schepen soude connen commen uijt den Rhijn tot ande Stadt bij A, En oock met groote schepen als het Rhijnwater wat hoochachtich waer.

Het soude oock oirboir wesen gelijk sijn Excellentie<sup>69</sup> voorwent, dat men de luyt nu neerwaert loopende van F na G, dede keeren vn F na B deur de gracht der buijtewercken, die nu drooch light, worpente de eerde daer uytcommende na de Rhijn sijde, soo hooch datter het Rijnwater uijtbleef.

Waerdeur de plaets met kleene cost seer soude verstercken. Het soude oock dan van B tot E connen een goede haven worden, tot groot gerief der Stadt,

*Voorlach*

*Hoemen de watermolen soude meugen leggen binnen de Stadt Lingen, tegen t'middel van een wal, blijvende nochtans het water des grachts in sijn beoorlicke hoochde, en dat sonder beeren of dodanen,<sup>70</sup>*

Laet A en B twee bolwercken betijcken, met een wal tusschen beijden, C het hujs vande watermolen,

*Folio 17 recto*

[Illustration]

*Folio 17 verso*

geleijt inde wals afdakingh. Hiertoe sal de waterloop veroirdent worden als volcht: DE is een houten coker inden wal diens bovekant soo hooch mach commen als het leeghste water<sup>71</sup> des grachts. De gront van dien coker sal als een waterloop verlangt worden van E tot F van F tot G van G tot H, al inde selfde hoochde des gronts der coker DE. Maer van H voorwaert tot den wal an I, sal sulcken gront des waterloops veel dieper geleijt worden, te weten ontrent een voet leegher dan de beke an K. Daer na salder geleijt worden een ander coker recht uijt van I tot

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<sup>68</sup> Deleted: 'viandt'.

<sup>69</sup> Abbreviated in text.

<sup>70</sup> Idem, *Wisconstich Filosofisch Bedryf*, pp. 74-75, *The Principal Works of Simon Stevin*, v, pp. 285-287.

<sup>71</sup> Inserted: 'water'.

K<sup>72</sup> diens gront inde selve hoochde sij van H I, als van I deur de wal I L, en voort opde gront des grachts L M, (gelijckmen in Hollant de cokers leght om polders drooch te maecken met watermolens die over d'andersijde vande watering liggen) en oock deur de contrescharpe M K, commende daer inde beke KN.

Dese waterloop aldus gemaect sijnde ,soo sal het waterrat van de watermolen commen ter plaetse van HI, en sal twater sijn behoirlicke val hebben. Voort salmen de waterloop EFGH met plancken decken om vrijelick daer over te meugen gaen.

Tis oock te weten dat men hier me versch loopende water inde Stadt soude hebben; En bij aldienmen den loop langher begheerde dan van F tot G, tis kennelick datment doen mach na sijn wille.

*Folio 18 recto*

Verstercking der vierhoecken van kleinder tot Grooter

*Folio 18 verso*

[blanco]

*Folio 19 recto*

De manier der verstercking van den kleensten vierhoek is als A met 4 bolwercken, een op elken hoek, maer grooter moetende wesen, als B met 6 bolwercken, een op elcken hoek, en een int middel van elck der twee langste gordinen, maer noch grooter moetende wesen, met 8 bolwercken als C, namelick een op elcken hoek en een int middel van elcken gordijn, waer uijt en uijt de voorgaende groote Stadt, de mejning van andere middelbare en grooter licht te verstaen is, Staet noch te gedenken, dat soomen den borstweren punt verstont sterck genouch te wesen met den hoek eenige weijnich \* trappen [in margin: Graden] minder dan recht te maecken, de \* puntsijden [in margin: facen] dan soo veel te meer bescherming van haer nevenstaende groote strijckweren souden hebben, als in de form D. Voorts datmen om overmate sterckte der groote steden op de sijden, mits de veelheijt der bolwercken op rechte linien die hoecken mette meeste buijte wercken can versien.

Wijders noch dat men de groote steden met alleenlick de helft der vier blocken huijsen, op de vier hoecken commende te verliesen, can verstercken als indeform E Te sien is.

*Folio 19 verso*

[Illustrations D and E]

*Folio 20 recto*

[Illustration and fortifications C.A.B. with defence lines]

*Folio 20 verso*

[Illustrations; no text and no defence lines, moats of illustrations C A B hatched]

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<sup>72</sup> A line in the margin beside the sentence 'Daer [...] K' indicates that it was meant to be inserted at 'na de beke an K'.

## Appendix C

### Constantijn Huygens: manuscripts (adversaria)

[Koninklijke Nederlandse Academie van Wetenschappen, on loan to Koninklijke Bibliotheek in The Hague, K.A. XLVII, fol. 146 recto – 148 recto].

C. Huygens, 'Musica, Medica, Physica, Chijmica, Odorifera, Perfumatoria, Fusoria, Coquinaria, Philosophica, Mathematica, Artificialia Constantini Hugenii, Atque Formandarum Et Poliendarum Vitrorum Ad Usum Astronomicum' verder aangeduid met 'Handschriften' (adversaria). Description of well drilling in Amsterdam in a letter to Marin Mersenne with drawings from Simon Stevin's *Huysbou* manuscripts.

#### *Folio 146 recto*

1 Hoe Dik ende Breed het ijser van het Booren ende hoe veel diameten de omtrent halve cirkel heeft.

1 Het ijser is omtrent aen den Rughdick een duijm, en boven omtrent 3 duijm. dogh scherp als een mes aen gesleepen om te snijden, de halve diameter vant Rondt die de boor maeckt is omtrent 11 duijm ront een gat weijt, diens diameter is 22: duijm. En is de Form vant boor als hier onder A is de Boor sonder net Ende boor op sijn breets te sien C de snij beugel B is de boor indt sijn net de snij beugel. C int vercorten te sien. de stock D langh ruijm 6 voeten ront in als te saamen omtrent 9  $1/2$  voett [voeten] E Het net van boovens te sien met de beugel. Hoe de stocken voorder sijn en in malcander coomen beij Stevijnt te sien.

2 Hoe veel gewicht van aerde men telcke reise wel opbrenght.

2. Alst Kleij is, soo is Het net en beugel vol, is een stuck van Form volgens de beugel. daer vande hoogte is 2  $1/4$  voett ende de breedte 11: duijm, maer sant soo ist maer  $1/4$ ,  $1/5$ ,  $1/6$ ,  $1/7$  oft minder vol naert sant wellende is, Ja al te niet een groote ofte gemeente cop vol. Ende naet seggen oft om de woorden te gebruijcken van Jop Adams putteboorder alst kleij is in drien een groote wastobben vol, ende alst sant is een halff emmertie en hoe klaerder welsant hoe minder om nu de swaerte te seggen, is uijt voorgaende onseker alsoo de stoffen van swaerte ongelijck sijn, en oock de groote vande stoffen die men optreckt ongelijck sijn.

3 oft het water niet het sandt oft aerde uyt ende door het nett wegh spoelt eer het boven gebracht kan werden.

3. doort net alsoo het op een ongemeene manier gebreijt is en kan geen sant deur spoelen, want int water commende wort het net heel dicht, soo dat in manier van spreekken dat kleywater in soude connen dreegen. maer dat het daer uijt spoelt int op haalen gelooft ja, alsoo men als boovens verhaelt maer soo een kleene menichte op haelt.

4 Hoe veel man aen tboor wercken, ende ofter niet meer ende meer, aen en moeten, hoemen dieper gaet, om het boor op te halen en oftmen daertoe niet eenighe Catrollen [oft] ander behulp hoeft .

4. Neegen mannen oft diep oft ondiep is of van veel volck, en hebben geen catrollen van nooden is alleenlijck een rol gemaek op de randt vande planck die overt gadt leijt omt touw te mackelijcker over te doen gaen daer meede seij het boor op haalen.

5 Hoe langh ende dick yeder stuck houts is ende oft het Boor machtig soude wesen door eenighe Rotsen oft Steenen te snyden wanneermense ontmoette

5. eijder stock omtrent 10 voett dick 5 a 6 duijm deen minder dander meerder, om door steen oft Rots te booren gaet niet wel, is al besoght bij pieter intes outoom van Jop adams. Ende Jop adams vader maer wilde niet gaen oft weef, boorden haer booren aen stucken, maer een steen gemoetende in 't booren al waert een keij raaken daer wel deur also niet reghd daer op en coomen, maer daer meer volgende soo kan niet voordr geboort worden- Hebbende in [gene]<sup>73</sup> besoght maer moesten onverrichter saaken uijt scheijden om de steen en rots

*Folio 146 verso*

6 oft de pompe tot beneden inden putt gaet, en hoe dat trecken van die pompe kan te werck gaen op soo grooten diepte. oftse gemackelick gaet, ende hoe dick van water sy uitgeeft.

6. Het water trecken uijt den putten gaet op verscheijde manieren, bij luijden die wijnich te werk van doen hebben, maeken booren aen een weijder gate daer seij het water dan uijt scheppen en laent dan weeder uijt de grondt op wellen. die meerder water gelijck willen hebben, maken een groote sementen back, soo diep datter het wel water in kan coomen, stangen dan een pijp daer in naer de gemeene manier daer door seij met een pomp het water trecken, al hetwater uijt die back soo seij dat vandien hebben, uijtgetrokken sijnde moeten weer wachten datter water in comt wellen – Eer seij weer connen pompen. Het water dat seij uijtgeeft is naer het wel water geeft daer de houten buijsen ofte pompen op coomen te staen is in deen meerder dan in dander dogh ordenaris de diepten willen wel het meeste water geeven. de houte pompen sijn eene boome geboort met een gat omtrent als de pompen inde scheepen min of meerder naer den eysch.

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<sup>73</sup> Illegible.

7 oft dese inventie nu alleen in dese landen wordt gepleegt, ende offse oock over zee in Engeland is geraekt.

7. in Eemderlandt eer de graaff van Mansfelt daer quam heeft Jop Adams daer geboort, om in Friesland en rondom als in amsterdam, maer weet niet datse in ander landen gemaect sijn. over soo, dan heij Jop Adams is versoght geweest vande keijser, dan is een ander heen gegaen, wat daer van gevallen is En weet heij niet

8 oftmen noch dieper dan de 232 voet van Amsterdam soude kunnen booren, en hoe diep wel.

8. Tot Amsterdam is de put geboort in 32. daaghen en 13 nachten En was dickwels in de nacht soo wel nagesackt also daaghs connen uijt booren, en hebben soo lang daer geboort datse dickwils meer verlooren dan sij wonnen soo dat om dieper te booren als daer het soude comen wegen loot de gronden lejden wilde. Het can wel soo in wellen dat terwijl seij Eetten 20: a 30 voeten toe saecken. Ende is eens gebeurt tot amsterdam inde molenstraedt dat het soo toe schoet oft welde dat sij het boor niet weeder connten uijt krijgen. als sandt comt ofte is dan wint men oft voordert men niet veel, want men moet de wellingh vant sandt meede uijt booren., Ende alsoo men vant sant weynich uijtrect, Ende de wellingh meede moet uijthalen, ende groote diepte veel tijt heeft van doen om den boor vant sant te ontlossen, en weer in te steecken, moet men eijndelijck na de gelegentheit van de plaetsen op houden, sonder op gestelden of eigentlick diepte te connen comen, dogh den deenen dieper als den ander can men booren Maer voor het uijtwellen van sant helpt wel dat ment water in de put hooger hout dant grontwater.

Dit is soo veel ick hebbe verstaen van Jop Adams putteboorder van Amsterdam woonende tot ouwerkerk wesende een soon vande persoon die de put int outmannenhuijs geboort heeft met een pieter intes. Inde gemeene wandelingh anders genaemt pieter put: was Een outoom van Job adams voornoemt en was dees pieter intes en de vader van Jop adams de eersten die hier int landt geboort hebben ende de cunst gepractiseert hebben. En was pieter intes een boer van Sperrwoude buijten Haerlem

*Folio 147 recto*

Dit volgende genoomen uijt Stevijn

Om den manier van Booringh te verclaren soo sal ick beschrijven 't geene daer aft dadelijck gebeurt is onder anderen tot Amsterdam indt out mannen huijs alwaer geboort is sulcken put 232 voeten diep op den tijt van 21: daagen hebbende gecost so van booren als ander onkosten 500 gulden waer over doende waaren 5 mannen te weten den meester met nogh 4 ander ende ende wert aengevangen den 16 junijs in t Jaer 1605

De diepten op elcken dagh gheboort was als hier onder den 16 junij diep geboort 51 voeten

17	—	22
18	—	14
19	—	12
20	—	17
21	—	16

22	—	14
23	—	14
24	—	11
25	—	.9
27	—	.8
28	—	10
29	—	.5
30	—	.5
1	Julius	6
2	—	.5
4	—	.4
5	—	.3
6	—	.2
7	—	.2
8	—	.2

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somma 21 dagen 232 voeten

De gronden sijn int booren bevonden alsvolgt

1	gehoogde aerde	7	voeten
2	darij en veen	9	
3	withe kleij	9	
4	sandt	8	
5	aerde	4	

---

dus ver Stevijn 37 voeten

dit volgende uijt het gedrukt  
briefje daer van uijt gedaen

6	kleij	10	
7	aarde	4	
8	sant	10	daer amsterdam meest op fondeert
9	kleij	2	
10	wit sandt	4	
11	swaerte aerde	5	
nota 12	mollem	1	
13	sandt	14	
14	santachtighe cleij	3	
15	sant met kleij vermenght	5	
16	sandt en hornen schilpies	4	

---

facit 99 voeten

17 na deese 99 voeten

is een kleij rit van

suijver kleij 102

18 sant 31 voeten daer de booringh ofte gravingh in  
gebleeven

dit volgende weder uijt Stevijn

doen de booringh gedaen was ter beschreeven diepten van 232 voeten soo was den Radt van eenijghen dat ment ter wijl dat met soo kleene cost en geschieden noch wel dieper soude geboort hebben om te sien wat vreemdicheyt soo van gronden als 't geene anders hadt mogen ontmoeten, dogh wert endtlijck beslooten beij die diepten te laten berusten.

*Folio 147 verso*

Van de gedaente des Boors.

Des Boors Form wert door de volgende teijckeningh aldus verclaert AB is een viercandt hout hebbende onder een eijseren pinne waer aen comt een bagger net C met sijn snijdende buegel en soo dicht gebreyt datter geen sant door sijpen can de drie gaten int hout sijn om daer door te steeken een stock als D ende daer mee int booren het hout AB te drayen op sijn penne ende alsoo het bagger net te vollen met stoff diender in comt Booven aent hout beij A is een korff beset met eijseren beugels teegen het splijten waer in commen magh het onderste van een ander hout gelijk t'voorgaende als hier EF deese twee houten worden t' saem vast gemaect met den eijseren bout G ende gelijk hier is het hout EF alsoo worden der meer gemaect soo veel noodich is om t'een int ander te steeken totte begeerde diepte te coomen.

Manier van Booren

Men heeft ver langhen tijt met seer groote havegeenen wel in d'eerde geboort om t'onder souken de gronden daermen sluijsen water moolens en ander swaer gestichten op bouwen wil oock mede om te weeten hoe diep veen/darije/cleij en ander stoffen leggen maer doen men daer mee onder water in drijffsant quam so en condemen meerder niet uijt reghten door dien dattet havegeer uijt getrocken sijn de het sandt vande canten weerom inde put viel ende die vulde— dit voorcoomen van deese swaricheijt bestaet de voornaemste oorsaek deseswonderbaerlijcken vondts weesende alleenlijck daer in geleege datmen die put die men boort ghe-  
deurichlijck met water moet opgevult houden wandt dat hoogher sijnde dant onder aertsche water soo perst het water des puts uijtwaers teegen het sandt dat in sijn reghte standt houdende, daer anders het onder aers water van buijten in de put dringende het sandt der canten daer in doet vlieten, welcke nootsaekelijckheijt oock bemerckt wort int uijthoosen van wateren leggende op modderighe oft weecke gronden die als dan vant water ontlast sijnde inde graght soo op coomen dat huijsen en ander gestichten daer omtrent staende na de selve weijcken ende in perijckle geraken van vallen soo in Hollandt tot verscheijden plaetsen gebleeken is

Maer want hem ijmandt verwonderen moght hoe drie ofte vier voet water binnen den put hooger dan buijten sulcken stercken persingh soude connen maaken van het sandt alsoo in sijn reghte standt te houden sonder vallen soo can daer aff wisconstelijck rekeningh gemaect worden deur het voor voorstel [...] des [...] bouckx vande Beginselen des water wights: al waer blijkt dattet water van binnen den put beij voorbeelt 4 voeten hooger sijnde dan van buijten dat als dan teegen elcke voet vlackx der binnen sijde die onder den booven cant vant omstaende leeghste water is perst 4 teerlincsche voeten waters meer dan teegen de buijten seijden welck elck genoomen tot 65 pondt ront het gewicht van 260 ponden, meerder off minder verschil van hooghde des binnen en buijte waters soude meerder oft minder persingh meebrenghen.



Aldus dan verclaert sijnde de oorsaeck hoe dattet welsandt de canten vanden geboorden put over ende blijft staende soo sal ick commen tottet schrijven vande manier des booren, t welck is dat het net al draijende vol stoff gecoomen sijnde men treckt t'elckens op en wert geledicht. Ende een stock diep genoegh sijnde, men steekter booven een ander in die met den ijseren pen vast makende Ende alsser alsoo veel stocken deen booven d'ander sijn tis hemelijck datmen om elck gevolt net op te haalen die stocken d'een voor d'ander na moet aff doen en om weeder van nieu te booren dat men deen stock voor d'ander na weerom moet aen doen.

*Folio 148 recto*

De put alsoo tot begeerde diepte gheboort sijnde t'welck int voorschreven outmannen huijs was als geseijt is 232 voeten soo worden daer in geworpen soo schilpen 12 voeten hoogh Ende houten pompen daer op gestelt den een in d'ander sluijtende tot booven toe welcke altijt int water staende niet en verrotten, dit volbraght sijnde wert bevonden datter was een gedeuringh loopende Fonteyn van 1 1/2 voet hooger vallende dant gemeene water des graghts, dit water loopende in een back wert dan uijt gepompt om te beesegen ende comt alsoo inden back op 24: uren omtrent [...] <sup>74</sup> tonnen waters en d'oorsaeck van het booven geschreeven geduerigh loop 1 1/2 hoogher dant gemeen water schijnt dat het landt van weegen de hooghe wateren hoogh door weeckt sijnde dan het gemeen water daer in hooger uijt can loopen.

De reeden warom men dat in een back laet loopen en dan uijt pompt is om dat men alsoo groote meenichte van vergaert water heeft dat met der haest magh uijt getrocken worden, twelck beij al dien mondt uijt den houten pomp trock sonder back soo haest niet en soude connen volgen Ende oorsaeck sijn dattet sandt van onder geweldeger soude op coomen doch de pompen nogh meer vervullen dan nu geschiet.

Merckt bevonden te sijn dat op den tijt van [...] jaaren het sandt in de pompen van onder op waert gecoomen is [...] voeten sulckx dat de diepte dieder eerst was van 232 voeten nu alleneijck is van [...] voeten: dogh en is dit van geen verlanck wandt het water evenwel uijt de selve diepte compt.

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<sup>74</sup> These and other lacunas correspond with the text. Stevin probably intended to insert passages from other publications or notes.

Fragments of text on architecture not written  
for *Huysbou*



## Appendix D

### Statements by Stevin about architecture not meant for *Huysbou*

*Simon Stevin*

S. Stevin, *ProblemataumGeometricum*, Antwerpen s.a., published in: *The Principal Works of Simon Stevin*, IIa,

*p. 134*

‘Geometriae, mediusfidius, utilitas magna, imo vera necessitas. Et vero, quid tandem non illi feremus acceptum? Ponamus nobis ante oculos pauca quaedam ex multis, sine quibus certè neque commodè, neque omnino benè viuitur. An non hinc domicilia, an non & urbes?’

S. Stevin, *Weeghdaet beschreven deur Simon Stevin*, Leiden 1586, published in: *The Principal Works of Simon Stevin* 1,

*p. 292:*

‘Gelijct onnutte cost waer een groote stercke grondt te legghen, die een swaer ghesticht draghen can sonder eintlick eenich ghebau daer op te willen brenghen: Alsoo is de spieghelingh in de beghinselen der consten verloren arbeyt daer t’ende totte daet niet en strict’.

S. Stevin, *Wisconstighe Ghedachtenissen*, Leiden 1605-1608, ‘1 Bouck des Eertclootschrifts’,

*p. 43:*

Tis ghebeurt dat ick van eerdewercken, rijswercken, timmering, metsing, smeding (en dierghe-lijcke daer inden Huysbou breeder afgheseyt sal worden) meer behoufde te weten dan ick deur boucken of Wisconstenaers leeren conde: Hier toe verstrecken my de werckcluyden elck in haer const voor beste meesters: Maer om in mijn leering goede voortganck te krijghen, ick volghde Wysentijt oirden, vraghende voor al den Eerdewerckers in eerdewercken, Rijstwerckers in rijswercken, Timmerlien in timmering&c. na de beteyckening van haer eygen woorden die ick my noodich bevant,, en niet en verstont, welcke ick als bepalinghen oirdentlick opgheteykent hebbende, en die van buyten gheleert, ick spraeck terstont met hun soo datse my verstonden, en ick hemlien, al hadde ick lange tijt met die handtwerckenomghegaen, gherocht alsoo met lichticheyt tot kennis van t’ghene anders veel langer tijt soude behouft hebben: Nu ghelijck dit versamen en leeren der bepalinghen eermen ande saeck comt, oirboir is in \* tuychwerckelicke consten [mechanicus artibus] alsoo ist oock inde \* vrije [Liberalibus Theoriae].

S. Stevin, *Wisconstighe Ghedachtenissen*, Leiden 1605-1608, 'I Bouck des Eertclootschrift',

p. 47.

'Angaende ettelicke segghen de Spiegheleling sonder daet onnut te wesen, het schint datmen de saeck met beter onderscheyt soude meughen insien. Om hier af mijn ghevoel te verclaren, ick segh by voorbeelt aldus: Daer men t'werck eens arbeyders die boomen int bosch afhout, soude voor onnut achten, om dat hyder self gheen huysen, schepen, molens, sluysen, tonnen, kisten, beelden en diergelijcke me en maectt [...], soo en is sijn arbeyt niet te verachten [...] en alsoo ist ook mette Spieghelelaers in de vrye consten, sy connen den Doenders stof leveren en voorderlick sijn sonder self Doenders te wesen: Als den Spieghelelaer Euclides, die wy nieten bevinden Doender gheweest te hebben, heeft nochtans voorstellen beschreven den dadelicken Boumeesters en Landtmeters, en ander doenders seer voordelick [...] Daerom een Spieghelelaers Spieghelelinghen die anders Doenders te sta commen, en sijn niet onnut al en is hy gheen Doender'.

S. Stevin in H. Stevin, *Materiae Politicae, Burgherlicke Stoffen*, Leiden 1649, 'II Onderscheyt van het Burgherlick Leven, Anhangh Simon Stevin tot de leser',

pp. 34-35:

't Is wel waer dat wetenschap van beyden tot de sake seer vordelick soude zijn, als by gelijckenis, ten hadde den vermaerden Boumeester Vitruvius daen niet beter geweest, dat hy metter hant hadde connen meesterlick metsen, timmeren, schrijnwercken, draeyen, plaesteren, steenhouwen, beeldt-snijen, schilderen, glaseschrijven, ende diergelicke ambachten meer, daer hy regelen voor geschreven heeft, maer gemerckt sijn leven daer toe te cort was, oock dat van alle dese dinghen, den mensch genouch can te doen geven, soo en moetmen niemant onmeughelick willen verbinden: Daerom wanneer de Spieghelelaers onervaren inde daet gelijc Ptolemaeus, Euclides, Vitruvius en haers gelijck waren, binnen de palen der Spiegeling blijven, so oeffenen sy hun onberispelick in haer berouf'.

S. Stevin in H. Stevin, *Materiae Politicae, Burgherlicke Stoffen*, Leiden 1649, 'III Onderscheyt van den Raden Oirden',

p. 53:

't Welck even soo toegaet, als met ymant die een groote Stad bevestight, alwaert niet genouch en is eerdewercken, Metselrijen, Timmeragien, Yser-Werck, en soo voorts te besteden an goede meesters, maer hy moet noch hebben Opsinders, die ga slaen of de gheene die in dagh-huyrwercken, hun gelt verdienen, oock of in aengenomen wercken de geleverde stoffen goet sijn, en gewrocht worden volgens 't besteck, doende den gheenen, die ongetroulick handelen, van hemlien bedongen loon so veel afcorten, of so straffen als de saeck vereyscht'.

S. Stevin in H. Stevin, *Materiae Politicae*, Leiden 1649, 'VIII Onderscheyt van de Crychspiegeling',

p. 185

'Ghelyck ymant diena reden en reghel een huys wil bouwen, eerst overdenkt de \* eintlicke oirsaeck [causa finalis] daert toe dienen sal, met een \* voortganck [progressie] vant heel huys totte delen; maer daer na ant werck vallende, verkeerdelick de deelen eerst maectt, die t'samen het heel voortbrenghen: Alsoo is hier myn voornemen sulcke oirden te volghen [...] sal ick mette leeghste beginnen'

Notes relevant to the reconstruction of  
*Huysbou*



## Appendix E

### Notes on the unfinished *Huysbou*

SIMON STEVIN:

S. Stevin, *Wisconstighe Ghedachtenissen*, Leiden 1605-1608, 'Eerste Bouck des Eertclootschrifts',

*p. 43:*

'Tis ghebeurt dat ick van eerdewercken, rijswercken, timmering, metsing, smeding (en dieghe-lijke daer inden Huysbou breeder afgheseyt sal worden) meer behoufde te weten dan ick deur boucken of Wisconstenaers leeren conde: Hier toe verstreecten my de wercklyden elck in haer const voor beste meesters: Maer om in mijn leering goede voortganck te krijghen, ick volghde Wysentijt oirden, vraghende voor al den Eerdewerckers in eerdewercken, Rijstwerckers in rijswercken, Timmerlien in timmering&c. na de beteyckening van haer eygen woorden die ick my noodich bevant, en niet en verstont, welke ick als bepalinghen oirdentlick opgheteyckent hebbende, en die van buyten gheleert, ick spraeck terstont met hun soo datse my verstonden, en ick hemlien, al hadde ick lange tijt met die handtwerckenomghegaen, gherocht alsoo met lichticheyt tot kennis van t'ghene anders veel langer tijt soude behouft hebben: Nu ghelijck dit versamen en leeren der bepalinghen eermen ande saeck comt, oirboir is in \* tuychwerckelicke consten [mechanicus artibus] alsoo ist oock inde \* vrije [Liberalibus Theoriae]'.

S. Stevin, *Wisconstighe Ghedachtenissen*, Leiden 1605-1608, 'Tweede Bouck des Eertclootschrifts Vant Stofroersel des Eertcloots', 'Oirsaeck der beschrijving deses 2 boucx',

*p. 51:*

'Nadien Sijn Vorstelicke Ghenade ghelesen hadde de Bouconstens vermaerde afcomst des Huysbou, endaubenevens hem inde Stertebou dadelick seer geoeffent: Soo heeft hij ghesien wat swaricheden daer in te vooren commen, van wercken die deur qua gront insincken en omvallen: En daer stroom teghen comt, hoese met hooghe wateren af spoelen, de grachten versanden, en verslemmen. Tot ettelicke plaetsen condemen inde grachten gheen behoirlicke diepeten krijghen, om de opwelling vant sandt: De heypalen en condem oock dickwils int welsandt tot gheen begheerde diepte gheraken. Sach voort dat sommighe havens versanden, of met slijck vervulden, welke men meenende te verbeteren, na groote cost somwijlen vererghert waren, en dat en raedt van d'een en d'ander teghen de bovenscreven onghewallen, dickwils seer verscheyden viel, sonder oopenighe gemeene eker gront gelet te worden, streckende benefens verloren costen tot onsekerheys des landts'



S. Stevin, *Wisconstighe Gbedachtenissen*, Leiden 1605-1608, 'Tweede Bouck des Eertclootschrifts Vant Stofroersel des Eertcloots',

p. 51:

'Oirsaeck der beschrijving deses 2 boucx': 'Soo hebbe ick 't selve onder sijn Wisconstighe gedachtenissen gestelt: Doch niet by den Huysbou vervought, maer by t' gemeen Eertclootschrift, als wesende groote roersels die niet deur menschen macht en geschien [...] waer af de ghemeene reghelen dieder uytgetrocken worden verder dan totten Huysbou strecken'.

S. Stevin, *Wisconstighe Gbedachtenissen*, Leiden 1605-1608, 'Tweede Bouck des Eertclootschrifts Vant Stofroersel des Eertcloots',

p. 65:

'Aengaende de gheduerighe inbrake die t' water daer doet, als vooren geseyt is, die wert deur menschen handen weerstaen, daer leggende en onderhoudende cayen en hoofden, van steen of hout, na de gheleghenthey: Doch want eygentlicker hier af inden Huysbou ghehandelt sal worden, en segghen daer af niet wijder'.

S. Stevin, *Wisconstighe Gbedachtenissen*, Leiden 1605-1608, 'Tweede Bouck des Eertclootschrifts Vant Stofroersel des Eertcloots',

p. 67:

'Aengaende de wijse van verdieping der dorpels, welcke deur kennis der oirsaken met meerder sekerhey gheschien can, die hebben wy inden Huysbou veroirdent'.

S. Stevin, *Wisconstighe Gbedachtenissen*, Leiden 1605-1608, 'Van de Deursichtighe', published in: *The Principal Works of Simon Stevin*, Vol. 11b [edited by D.J. Struik]

p. 800:

'Nu alsoo ick over eenighe jaren, voor my self beschreven had een Huysbau, tot welcx oeffening den Boumeester, na t' ghemeen ghevoelen van velen, en t' besonder gevoelen van Vitruvius int 2 hoofdstick sijns 1 boucx, kennis der verschauwing voorderlick is, soo heb ick breeder dan daer te vooren deursien en ondersocht verscheyden Schrijvers van dese stof handelende, en na mijn stijl van dies een beschrijving ghemaect'.

S. Stevin, 'Waterschuyring' in H. Stevin *Wisconstich Filosofisch Bedryf*, 'Vanden Handel der Waterschuyring Onses Vaders Simon Stevin' published in: *The Principal Works of Simon Stevin*, Vol.v,

p. 204:

'Angesien veel Huysen, Schansen ende Steden, gebout worden op bedijckte landen, alwaer kennis vande gemene eygenschap der schuyring vorderlick is, soo sal ic nu daer af als totten huysbou gehoorende wat seggen'

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Loci communes font formae omnium rerum agendorum virtutum aliorumque communium, thematum, communes, quae fece in usum variasque rerum humanarium ac luterarum causas incidere possunt [...] 1604

*Folio 194 recto*

[In margin: Latrinas non foetidas facere]

Hy seght in de pampieren van syn Huysbouw, dat men, om den stanck van de secreten te benemen, [onder doorgestreept] tot onder het quelmsant delven moet, omdat de stront, int water vlietich wordende, also met het water doortrecken mocht, met stanck met al, sonder noot te hebben van te moeten geruympyt worden, ende dat men de buysen, daer de strondt deur valt, recht nederwaerts soude doen strecken, seer effen synde, opdat de stanck daer niet in en bleve hanghen.

Maer ick segghe daerboven, dat men die buyse hoe leegher hoe wyder behoort te maken, opdat de strondt die nergens en raect, ende de stanck, opwaerts kommende, altyt meer ende meer teghenstandt ontmoete, gelyck ick int contrarie ergens van den roock geschreven hebbe.

[In margin: Aqua an comprimi possit.]

STEVYN, in de pampieren van Huysbouw, seght, dat hy in syn handt hebbende een glaesken boven met een kleyn gaetken, gelyck een spellepunt, ende het glaesken vol waters, datter boven op dat kleyn gaetjen een blaesken quam staen, solanghe de warme handt daeraen was; maer die daer af synde, sonck het wederom in, totdat de warme hant daer wederom aen quam ende so voorts.

[In margin: Stevyn etiam putat aquam plus loci occupare quam glaciem]

Daeruyt beslydyt hy, dat alle water koudt wordende, verkleyndt, ende warm wordende vergroot, ende derhalven dat het ys min plaetse beslaet dan het water ende dat daerdoor de glasen breken ende de steenen in de vorst vermorselen.

Doch dese opinie van het ys hebbe ick teghen alle andere physici, uyt Stevyns Waterwicht selve, vooren ergens oogenschynelick wederleyt, omdat het ys int water dryft etc. Ende van het blaesken, daer hy van seght, is gekomen van het verdunnen des lochts van binnen int glas; want het glas en kan niet heel vol water geweest syn. Dit blyckt uyt myn nagebotste gelas, daerdoor ick de koude afmete. So dan int gaetken wat vochticheyt sittende, wiert opwaerts gedronghen door de warmte des handt, de locht van binnen uytgespreydt wordende.

[In margin: Welsandt quomodo fiat]

Stevyn seght seer wel in de pampieren van de Boukonst dat het sandt welsandt wort als het water van het landt daer rontsom hoogher staet in de aerde dant op dat sandt doet, want dan syncket van onder opwaert door het sandt om even hooghe te syn. Ende so gebeuret oock, dattet somtyts welt, ende somtyts niet en welt, naerdad de nevenstaende landen drooch of waterich worden.

*Folio 195 recto*

[In margin: Candelarum scintillatio quomodo præveniendā]

Dese granulatie mach oock seer wel veroorsaken het daveren van de vlamme der keersen, dewyle de vlamme van oly ende sonder twyffel van gesmolten roet, niet en davert, ja hoe pens-roetachtiger, ende boterachtigher de keersen syn, hoe min haer vlamme davert en danst.

Om dit te voorkomen, ende evenwel de keersen hardt te maken soudemen moghen deuren ende veynsters toesluyten, belettende het roet aen de keersen subtelick te styven. Want al alleynskens styft, so krimpet gelyckelick, gelyck STEVYN schryft in syn pampieren van syn Boukonst van houdt ende kley, want kley, by het vier gedroocht, kryght boven spleten, omdatter veel vochticheyts uytgaende, de materia superficialis minder wort, niet konnende, gelyck te vooren al het binnenste begrypen. Also oock het hout, in de Sonne staende. Maer als kley ende houdt alleynskens noch drooghen, so krimpet al seffens, het binnenste vocht tyts genoeg hebbende om mede uyt te trecken.

*Folio 195 verso*

[In margin: Goten tusschen de huysen vant sneewater bevryden]

Stevyn meyndt in syn pampieren, dat de loode goten tuschen twee huysen niet goet en syn, voornementlick om het sneewater, dat daerin valt, die stopt. Maer men gebruyckt hier te lande somptyts delen daerin geleydt eenen halven voet van de gront, daer de snee op vallende, daeronder gheen verstoppinghe maken en kan.

*Folio 198 verso*

[In margin: Stevini manuscripta selectiora 35 folijs comprehensa.]

SYMON STEVYN'S pampieren hebbe ick beginnen te ondersoecken ende hier te noteren t'gene ick best acht ende dienstelickxt, den 18en Sept. 1624, behalven den Huysbou, dewelcke ick eenighe maenden te vooren ondersocht hebbe, ende op ander pampieren uytgeteeckent, dat my goet docht.

*Folio 263 recto – 263 verso*

[In margin: Columnarum elegantia unde et cur tantum quinque]

'Also ick over langhen tyt ondersocht hebbe de reden van de compositie ende ornamenten des onderscheyts der vyf colommen daertoe veel boecken gelesen behalven Vitruvium nu onlanx ende Stevyn Huysbouw ongedruckt so en kan ick anders niet verstaen dan tgene ick vooren ergens geschreven hebbe van het gebruyck, gewoonte van sien, ende de deylinghe in twee gelycke deelen, dat dat de dynghen syn, die een werck fray maken en ende weynich anders; als namentlick, de 3 voorgaende geobserveert synde, dat men soveel veranderinghe make als men kan, hoe meer hier frayer etc. Daerom sie ick teghenwoordich in kercken, etc, al heel anders alle dynghen. Waerdoor my in den sin komt, dat het plach te gaen met die treffelicke wercken gelyck het nu met de slechte wercklieden, te weten gelyck de onervarene wercklieden, als sy een bestek sien van een fray huys, so schryven sy dat uyt ende formeren haer werck daerna, ende vreesen daerbyten te gaen, of sy misschien door veranderinghe het werck een ander ooghe deden hebben, de proporties anders wordende. Also dewyle weynich wercken so treffelic als te Ephesen, Corinthen, ende de eerste Dorica etc., gemaect syn geweest, de welcke van een goet meester eerst gemaect syn na goetduncken niet dat het anders niet en syn mocht, maer omdat

het hem oock so goet docht ende dat hy veel ander gestichten gesien hadde, die niet goet en waren – dese treffelicke gestichten dan de lieden behaghende, hebben de wercklieden daeraen haer maten genomen ende gevreeset yet anderste doen dan daerin gedaen was; ja selve die niet en dorsten menghen, namentlick alser yet treffelickx gemaect moet worden. Twelck oock niet verwonderen en is dat se seker hebben willen gaen daer haer eere aen geleghen was.

Dits dan den oorspronck des onderscheyts der 5 columnen, ende hadden der meer treffelicke wercken, die d'een van dander niet en wiste, geweest in die tyden als men in Griekenlandt daervan begon de beschryvinghe te doen, men soude al meer columnen gehadt hebben.'

CONSTANTIJN HUYGENS:

Manuscripts (adversaria)

Koninklijke Nederlandse Academie van Wetenschappen, on loan to Koninklijke Bibliotheek in The Hague, K.A. XLVII, fol. 146recto – 148recto:

*Folio 147 recto*

Dit volgende genoomen uijt Stevijn (See Appendix C)

Domus

The Hague, Koninklijke Bibliotheek, XLVIII, fol 733r-745v:

*Folio 148 recto*

Cataracta replenda. ratio fundamenti. nec sene vitio tuo. quod mirum. Stevin was 't Wellsand. Eodem anno equile extrectum, gelycksydich, sed non accuratus membris ut postea indicabitur. vid. an deprohibit'

HENDRICK STEVIN:

Brief Hendrick Stevin aan Constantijn Huygens?

Bruges, Stadsarchief, Oud Archief, 109 series, Autografen, pf. 1620-1650, no. 215 bis:

'Mijnheer,

U Ed: schrijven vanden 27. Januarij is mij heden behandicht: waerin U Ed: van mij begeert het Tractaet vanden Huysbau bij mijn Vader Sal: nagelaten, daer van misschien een volcommen beschrijvinge verwachtende, dieder uijtte voorrede van sijn eerste boeck der Deursichtigen te weten van de Verschauwingh volcht gheweest te sijn: maer alsoo Ick die selfs maer onvolcommen en heb, noch oock noijt anders ghesien en hebbe. Derhalven oock alijt in vermoeden gheweest sijnde selve, neffens den Chrijchhandel met noch eenige andere dingen daer ick oock maer onvolcommen van versien, ben onder Sijne Excellentie te schuijlen soo sal ick evenwel niet nalaten my, mettet geene dat Ickker van hebbe, soo van mij mogelijk sal sijn, bij mijn heer

te laten vinden, e, sooder noch ijert anders waer daermede Ick mijn heer eenigen dienst konde doen, en mijn heer mij daer toe gelieffde te ghebruijcken. Ick soude bethoonen dat ick waer mijnheer uw ed; dienstschuldige Hendrick Stevin uyt Haserwoude den 1 februarij 1636<sup>7</sup>

H. Stevin, *Eenighe Stucken der Crijchconst beschreven deur Simon Stevin*  
The Hague, Koninklijke Bibliotheek, 128 A 9-11,  
[Commentary by Hendrick Stevin:]

*Folio 1 verso*

Al hoewel de oirdening der steden niet en is gehoorende tot dese Crijchconst, maer totten huijsbou; soo schijnt dit haer behoerlicke plaets niet: Doch gemerckt daer in vervadt is het besonder gevoelen van mijn Vader Za: angaende de saeck der oirdening en versterckinge van Steden en Schansen, namelick dat groote en kleinne Steden en Schansen daert de gelegentheijt der plaets daermen die leggen wil toelaet, om sulcke redenen als int volgende tsijnder plaets geseijt sal worden, al behooren veroirdent te worden rechthouckich viercant, en nochtans sterck tegen t gemeen gevoelen der hedendaechschen Stercktenboumeesters; Daer van ick de meijning (alsoo ick de volcommen beschrijvinge diens angaende van mijn Vader Za: niet gevonden en heb) Int leste deser Stedenoirdening deur Eenige formen [*de meijning' deleted*] eenichsins verclaert hebbe. Ick heb hier noch bijgevoucht als Voorslach van mijn Vader Za: Angaende de gracht der Schans te Berck, mitsgaders een voorslach des selves angaende tleggen der watermolen binnen de Stadt Linghen, Die ick onder eenige andere \* vonden [*in margin: Inventien*] tot dienst der Steden Dantsich, Calis, Elbing en anderen ghevonden hebbe.

[Commentary by Simon Stevin]

*Folio 2 recto*

Angesien uijt vergaring van veel huijsen, Steden commen die wel veroirdent sijnde tot groote bequamheijt en gerief der huijsen strecken, soo is de oirdening der Steden stof totten huijsbou gehoorende, daerom sal icker af seggen als volcht.,

H. Stevin, *Materiae Politicae*, Leiden 1649

'1 Onderscheyt van de Oirdeningh der steden' and the 'Byvouch der Stedenoirdeningh, vande Oirdeningh der Deelen eens Huys met't gheene daer ancleeft'.

1 ONDERSCHEYT vande OIRDENINGH der STEDEN

An den  
EDELEN GROOTACHTBAREN,  
Welwijsen, Seer Voorsienigen  
Heeren  
Myn Heeren  
SCHOUT, BURGERMEESTEREN, SCHEPENEN en  
RADEN der STADT AMSTELREDAM

*Edele, Grootachtbare, Welwijse, Seer voorsienighe Heeren.*

Want der Steden merckelickste begin Burghen waren, diens inwoonders Burghers, welckers reghelen daerse na leefden de Burgherlickheyt, soo schijnet den natuerlicken eysch, datmen int beschrijven van dien met der Stedenoirdening aenvanght; Oock niet buyten wegghen met U Ed: Grootachtbaerheden (als welckers wijsheydt en sorghvuldigheden int beleydt vande hare niet weynich uyt en steeckt) int besonder daer af te handelen. 't Welck de reden is dat ick, behalven de toeeyghening des heelen boucx, gedacht heb, sonder misslach, U Ed: Grootachtbaerheden dit eerste Onderscheyd vande oirdeningh der Steden in't besonder te connen werden opgedhraghen. Waer toe ick te crachtiger ghedreven wiert, Anghesien d'oirden diese in haer Stadt volghen (onder verbetering geseyt) der wijse met dese overeencomt, datse of als een selve gelijcken, of dat dese uyt de grontregelen van die haer oirspronck schijnt te hebben; Ja dat soo ymandt den last had, de grontregelen van U Ed: Grootachtbaerheden Stadoirdeningh by gheschrieffte te verclaren, hy voldoen soude connen, mits dese Stedenoirdening haer anbietende. Maer om dit wat eygentlicker, doch cort, te overlegghen; Wat begheert den Schrijver int eerste Hooftstick tottett maken en onderhouden der beste Stadt na syn ghevoelen, daer U Ed: Groot Achtbaerheden niet na en trachten ten sy in die deelen, welcke om noodighe oirsaken daer niet vallen en connen? Dat heylsaem leven onder haer ghebedt, bevesticht dat niet onwederspreklick sijne strijtredens des selven eerste Hooftsticx teghen Aristoteles en anderen? Sulcx datmen met goede redenen, u Stadt tot voorbeelt ghebruyckende, de ledighe plaets op die strijtredens volghende ter eener syde aldus soude moghen vervullen: *Tot voorbeelt van desen can ons dienen die vermaerde seer groote en volcricke Stadt Amstelredam in Hollandt; Alwaer deur bet constich beleydt der regieringh het volck in sulcken Lofflicken Stant ghehouden wort, datmen niet en geloofft buyden op den Aertbodem een Stadt gevonden te worden, daert dienaangaende veyliger en geruster te wone is?*

'tWelck anghemerckt, en somen uyt gevolgh mach oirdeelen, wie sal niet beslyuten, dat (indiense voorhadden en vermochten na haer welgevulle een Stad van nieus op te bouwen) na allen schijn U Ed: Grootachtbaerheden inde rest metten Schryver soudent stemmen? Nu al waert dat myn gissinghen hier in feylden, soo en blyckter nochtans gheen uyerlick teycken dat my soude connen bewegen U Ed: groot achtbaerheden bescheydenheydt yet gheringhs niet te durven verghen. Ja al vonden de selve in dit myn doen gheheel gheen smaek; Hoe can haer in allen ghevalle onangenaem syn, dat ick hier deur geleghentheydt neem van-er te wenschen ghe-duerighe vergrootingh haerder Stadt? En als een voornaem Lidt deses Staets, daerbenenevens my bekenne en altydt, daert de saeck vereyscht, wil bethoonen te syn.

*Edele Grootachtbare, Welwijse, seer voorsienighe Heeren*

U Ed: Grootachtbaerheden dienstschuldige Dienaer

*Hendrick Stevin?*

1 Onderscheyt van de Oirdeningh der steden

1 HOOFSTIC.

Vande middelen daermen groote machtighe Steden deur maken can.

*p. 9*

H: S:

't Gheen den Schrijver hier Opperschool en Hoochschool heet, dat noemt hy int 7 Hooftstick des volgenden 3 Onderscheyts Gemeenschool. By dit Hooftstick had den schrijver angheteyckent dat hy noch moest segghen vande Grootste Steden, als Ninive, Babilon, Alcaire, China & c. Waer me de ledighe plaets volgende achter de woorden: Tot voorbeelt van desen, onghetwijfelt vervult soude geworden hebben.

2 HOOFSTIC.

Vande verkiesing der plaets daermen de Steden wil legghen.

*p. 11*

H.S.

Tot hier toe geseyt wesende van de middelen daermen groote machtige Steden deur maken can, oock vande verkiesingh der plaets daermense ten besten oirboir leggen moet, ende dat int volghende somtijds 't woort Lijckzijdicheyt, te pas sal commen, soo sal ick hier eerst als 3 Hooftstick soo veel des 3 lidts vant 2 Hooftstick der Huysbou (daer deser Stedenoordening oock uytgetrocken is) in vougen, als ghenoech schijnt om te kennen te gheven wat den Schrijver int hier na daer me verstaen wil hebben.

3 HOOFSTIC.

Vande bepalingh en beschrijvingh der Lycksydigheyt.

*p. 25 = p. 17*

H.S.

Dit is't geene ick hier uyt het gemelte eerste Hooftstick der huysbou in der stedenoordening heb willen brengen (om den gront des woorts Lycksijdicheyt na de meyning des Schrijvers te verstaen) daer van den rest mettet uytgaen der selver huysbou sal volgen.

4 HOOFSTIC.

Vande form der Steden.

p. 26 = 11: Totte blocken der huysen sijn genomen viercanten elcke sijde van 360 voeten, 't welck ick in groote Steden voor bequame langhde houde, om twee erven van huysen rugghe-lingh teghen malcander te commen, daer af de reden eyghentlicker verclaert sijn \* int Hooftstick der Huysbou.

pp. 26-27, (i.e., pp. 18-19): 'Welcke verdeeling oock gedaen can worden na de manier die int volghende 5 Hooftstick verclaert sal worden'.

pp. 26-27, (i.e., pp. 18-19): 'Welcke verdeeling oock gedaen can worden na de manier die int volghende 5 Hooftstick verclaert sal worden'.

6 HOOFSTICK.

Van Looven voor de huysen op beyden zyden der straten.

*p. 31*

H:S:

De Form deser Looven is beschreven inden Huysbou.

7 HOOFSTIC.

Vande Lycksydighe vergrooting der Stadt.

Byvouch der Stedenoirdeningh, vande Oirdeningh der Deelen eens Huys met't gheene daer ancleeft

CORTBEGRYP DER BYVOUGH.

*p. 40*

H.S.

Int voorgaende is meest oirdening beschreven, waer van het beleyt den Overheden toebehoort. Maer anghemerckt het groot gebruyck, dat de huysoirdening onder de Burgerijen by elck een heeft, so sal ick daer af, als anhangsel der Steden, desen Byvoug formen; Doch, gelijk ick segge, alleen int ansien van oirdening, en volgens het alghemeen voornemen, alleenlick soo veel vant selve, als yder gesont oirdeel (al en isser geen kennis noch genegentheydt totte Wisconsten by) dat lesende, verstaen can: Waer af het dadelick maecksel en ander omstandigen inden eyghentlicken \* Huysbou (\*Architectura) beschreven sijn.

1 HOOFSTICK

Vande Lijksijdige oirdeningh der Romeynsche en Griecsche Burgherlicke Huysen.

*p. 41*

H:S:

Dit Hooftstick moet ghenomen worden als oft vervolghde opt voorgaende 3 Hooftstick der Stedenoirdeningh. En hoewel ick daer gheseydt heb dat te sullen volghen inden Huysbou, soo dunckt my nochtans nu 't selve ghevoughelicker (als totte huysoirdeningh noodich dienende overdacht) hier te sullen worden ggebracht.

2 HOOFSTICK

Vande vervouging der lichtplaetsen

De reden waerom de boveschreven dobbel rijen van camers my beter bevallen dan ijnckel, sal t'sijnder plaets inden huysbou verclaert worden.



3 HOOFSTICK.

Vande Looven der Lichtplaetsen.

*p. 57*

Die vallen op tweederley wijsen d'eene langs de huysing, d'ander door't middel der lichtplaets malcander cruysenden. Angaende d'eerste soorte, ick soude daer oock liever hebben buytelooven van ghedaente als de looven voor de huysen op beyde sijden der straten, daer int 6 Hoofstick der voorgaende Stedenoirdening af gheseydt is dan binne-looven die de ghevels draghen, welcker beyder ghedaenten en ander omstandigen inden huysbou't haerder plaetse eyghentlick sal verclaert worden, en dat om de redenen aldaer beschreven, namelick dat de camers, daer achter vryer lichter krijgen, en dattet vaster ghebou maeckt: Noch valt hier te segghen int ghebruyck te sijn van inde lichtplaetsen twee of drie looven d'een boven d'ander te veroirdenen, mede inden voorseyden huysbou beschreven dienende voor gemeene gangen tot al de camers daer op uyt commende

4 HOOFSTICK.

Vande vervougingh der camers of percken en ander noodtlickheden die t'samen het heel Huys maken.

*p. 62*

Angaende steyghers vanwelcker verscheydenheydt en eyghenschappen inden Huysbou gheseyt is.

*p. 63*

H:S:

Hier uyt schijnt dat inde voorgaene 2 form de keucken moet wesen in plaets der vertreckcamer, Doch nadien ick de teyckeningh soo vont, hebse soo ghelaten, connende die wel, de keucken daer af maken, of soomen de keucke neemt inde kelder te wesen, so verstreckt die voor een camer.

*p. 65*

H:S:

Dus verre vande vervougingh der Camers of percken die t'samen het heel huys maken, de rest sal metten huysbou vervult worden.

5 HOOFSTICK.

Deur welcke camers of percken datmen bequamelicxt gaen mach, om tot d'ander te commen, deur welcke niet.

*p. 72*

H:S:

Den Schrijver had hier noch ongheteyckent, dat hy van meyning was hier noch verhael te doen van een Vorstelick huys met al sijn Vergaringhen daer by, hebbende elcke Vergadering een lichtplaets mette huysing daer rontsom ten eynde om te ghenieten de ghemacken en voordeelen daer by 't laest vant 1 Hoofstick der volghenden 3 Onderscheyts, van der Raden oirden, af

gheseyt sal worden, en int 4 Hooftstick der voorgaende Stedenoirdening oock eenich vermaen af geschiet is. Doch alsoo, uyt dit Hooftstick en het voorgaende 2 Hooftstick deses Byvougs, de ghemeene reghel van alle grooter en kleynder ghestichten verstaen can worden, soo wortet hier by ghelaten.

8 HOOFTSTICK.

Van schoorsteen, te weten om die te veroidenen datse wel roock trecken

*p. 82*

H.S.

Gevought de reden waerom den Schryver de voorgaende laetste wijze van Schoorstenen best bevalt, totte verclaring vande oirsaken der beterschap, die een viercante schoorsteen na de manier vande derde form deur haer coker crycht, men sal daer uyt lichtelick verstaen, hoe den roock van boven noch minder belet soude crygen, soomen op de selve laetste form stelde een coker van gedaente als hier nevens.

9 HOOFTSTICK.

Van 't ondereertsche werck als Bornputten, Regenbacken, Heymelicken en Kelders.

*p. 85*

H.S.

Wat aengaet de gedaente des boors, manier van booren met veel ander omstandicheden, dat sal inden Huysbou vervult worden.

*pp. 90-91*

H.S.

Maer ick en sie niet hoe datmen het sant onder S T, uyt en in soude connen crygen, om dat te ververschen, soot noodich viel; want het soude van S en T inde form O deur V tot Q moeten gebrocht en uytgehaelt worden; ende inde form D, van S en T deur V over Q tot X.

Daerom soomense veroidende als op pag. 91. staet onder A en B, so can het sant overal van boven uyt en in gedaen worden, moetende nochtans het water in A syden van C tot onder D, van D over E, van E onder F, en van F tot G; en in B noch verder van G tot H, en van H tot I.

*p. 98*

Angaende overwelsels diemen billichlick voor gedeelten van kelders hout daer af sal ick seggen inden Huysbou, alwaer vande overwelsels int gemeen sal gehandelt worden.

10 HOOFTSTICK.

Van de daken

*pp. 102-103*

H.S.

Den Schryver had noch ergens angeteyckent datmen met mortel en hout oock daken can maken van buyten en binnen met trast bepleystert, sonder sijn goetduncken daer af by 't selve gevonden te hebben. Voorts vervolcht hy dit Hooftstick in deser vougen:

Tot hier toe is vande stof der daken geseyt, belangende de form, die is van vierderley voornamelicke verscheydenheden, als Sijdgotichdack, Voorenachtergotichdack, Cruysdack, en Trechterdack. Sijdgotichdack is, diens regenwater vant huys valt in goten op de sijdmueren liggende, streckende gemeenelick vande straet achterwaerts. Voorenachtergotichdack is, diens regenwater op de voorsijde en achtersijde vant huys afvalt, in goten streckende gemeenelick eweydich vande straet. Cruysdack is int welke twe rechte necken recht cruyseling op malcander commen. Trechterdack is, dat niet gespannen wordt vande muerplaten opwaerts, gelijk de drie voorgaende, maer vande muerplaten neerwaerts na het middelste vant huys, om het water aldaer te vangen in regenbacken gemaect na de manier beschreven int 9 Hooftstick deses byvouchs, en ter plaetsen daer toe veroident inde tweede form des 4 Hooftstick.

Doende voorts wijtloopige verclaringen van yders voordeelen en achterdelen en ander omstandigheden, deur teyckeningen; Doch alsoo de meyning niet en is in dese huysoidening alles soo puntelick af te handelen, soo sullen wijt hier by voor ditmael laten berusten, alleenelick seggende dat het laetste, namelick het Trechterdack is, 't gene den Schryver best bevalt, onder anderen oock om de bequaemheden verclaert int 13 Hooftstick vande gedachtenissen opt model vant huys.

11 HOOFTSTICK.

Vant cieraet der Gevels.

*p. 104* Vant gebruyckt der pilaren tot gerief.

Dat op twe voornamelicke manieren valt: Ten eersten dienense tot loven, van wiens oirboir en omstandigen geseyt is int 6 Hooftstick der voorgaende Stedenoirdening, en het 3 Hooftstick deses byvouchs en breder geseyt sal worden inden Huysbou.

13 HOOFTSTICK.

Inhoudende gedachtenissen opt Model vant Huys.

H.S.

Met dit Model wort verstaen een vande Modellen na de voorschreve regelen der huysoidening gemaect, en jegenwoordich berustende op de Biblioteek van SYN HOOGHEYT: Welcker een ick verschaet heb als dese bygaende form; Doch na de grontteyckening en stantteyckening des voorgaenden 4 Hooftstick daer mede genouchsaem overeencommende, hebbende noch tot behulp seker teyckening int rou van haer model genomen waer in men sien can hoe het trechterdack syn waterloost inde regenbacken commende int middel vant huys, hebbende elcken regenback syn dackvenster, om des noot sijnde, daer in te connen climmen.

Vande Lijksydicheyt.

Dit huys heeft syn Lijksydicheyt int geheel, gelijk oock doen de gedeelten, want de Voorsael, eetsael, slaepcamer, keucken, Bottelrye, en ander camers, elck haer Lijksydicheyt hebben.

Vrylicht.

Daer en is niet alleen vrylicht inde groote sticken, als Salen, keucken, bottelrye, kelders, en ander camers, maer oock inde gedeelten, als trappen, gangen, contoiren, cabinetkens, en hey-melicken, elck niet een volcommen cruyscassyn. De Dacksolders hebben oock haer Vrylicht, niet door Dackveinsters, dat Lapwerck schynt, maer deur veinsters inde Gevels.

Daer en werden nergens eenige camers ontvryt, om licht te geven an trappen, of gangen.

Oock commen al de Veinsters inde gevels sonder eenige dwanck evegroot, en evewyt van malcander, en met volcommen Lijksydicheyt.

Dack.

Het trechterdack heeft de bequaemheyt dattet al thuyt deur fonteinkens geeft, sonder water te moeten putten of pompen.

Ten heeft geen goten noch de swaricheden die van goten commen, maer water en snee valt daer vrylick af, sonder de Naburens huysen te

[Illustration between pages 116 and 117]

verhinderen, oock sonder de snee te moeten uytschuppen.

Dese daken en lyden soo groot gewelt der stormen niet, om datse an allen sijden met muren en gevels beschermt zijn.

De Daken (die gemeenelick onbehaegelicker int gesicht syn dan gevels) en worden hier niet gesien, maer commen de schone gevels alleen int gesicht.

Looven.

De wyse van Looven is beter dan die de Gevels dragen, om verscheyden redenen: Ten eersten dat d'een helft der cruyscassynen vrylicht geeft; Ten anderen de Gevels syn aldus stercker om swaerte te dragen. Loven boven Loven maken onvrye camers, oock onbequaem, deur dienmen buytens huys moet gaen om van d'een camer tot d'ander te commen.

Steygers.

Den Heer heeft syn eygen steyger om in syn quartier te gaen, want onderste der kelder tottet bovenste vanden huuse, ongesien van ymant anders des huysgesins, die een ander steyger hebben.

De steegers syn soo veroident, dat men tot alle camers mach commen sonder eenigh ander camers te ontvryden. Met dese twe steegers can elck deel van 't huys dienen voor een besonder huysgesin.

Vande vasticheyt vant huys in syn geheel.

Het huys in syn geheel heeft groote vasticheyt, om de muerkens die op beyden sijden der camers overdwars commen, sulcx datmen daer op als men wilde, in plaets van houten solders soude mogen steenen overwelsels metselen, want die muerkens als contreforten of pilaren, het steken der bogen souden connen verdragen.

14 HOOFTSTICK.

Vande manier des gebous om versekert te syn tegen brant.

*p. 118*

De solders salmen, van onder dick bepleysteren, na de manier inden huysbou beschreven, of noch beter in die plaets steene overwelsels maken, van welke mede inden huysbou eygentlick gehandelt sal worden: De spannage of cap van gesaecht hout wesende, salmen oock dick bepleysteren, en decken met tegelen, daer int 10 Hooftstick deses byvougs af geseyt is, welke int vier gebacken zijnde, den brant connen verdragen beter dan leyen, loot, of coper: Alle binnen gedeelte vant huys, als steegers, portalen, schrijfpercken, heymelicken, cassen, turfbacken en diergelijke sullen al overwelf syn van steen, 't welck geschien mach na de lijcksydige oirdening die ick daer af inden huysbou beschryven sal:

Vande stof der cassynen van deuren en veinsters met die der luycken

*p. 119*

Hier beneven hebben sulcke huysen met gepleysterde solders en daken ten grooten deele, alle de voordelen en bequaemheden der stene overwelsels daer inden huys bou breder verclaring af geschien sal.

H.S.

*Want hier deur sekere misrekening eenige sijden ledich souden overschieten, soo sal ick om die te vervullen tot des voorgaende huysordening noch yet bydoen vant geen totte gevels behoort, en eerst seggen*

Vande Stof der cassynen van deuren en veinsters met die der luycken

Vande diepte der bornputten

*p. 127*

H.S:

*Dit volghende was noch besloten int 9 Hooftstick vande onderertsche wercken by de Bornputten te brengen, doch 't selve by ongheval daer overgheslegghen sijnde, sullender dit blad mede vullen.*

‘Tytels en Cort begrypen’,

p. 144 ‘Vanden Hausbau Vervangende mede ‘t geen noodich is tot bevordering der welvaer, behoudenis en geduerige verbetering van Steden en Landen na des Authuers gevoelen: waerby noch gevoucht is Weechdadelichen Handel van Cammen en Staven in Watermolens en cley-trecking’.

H. Stevin, *Wisconstich Filosofisch Bedryf*, Leiden 1667

[Note by Hendrick Stevin]

Book II, fol. 3.

‘Hebbende ons Broeder Frederic Stevin zal., in syn joncheyt, geleden ontrent dertich jaren, ter studi gelegen bij enen Heer Abraham Beecman, doen Rector tot Rotterdam, en groot liefhebber der Wisconsten; hadde hy Beecman, by die gelegenthey, de hantschriften onses Vaders Simon Stevin, die onder ons Moeder doen noch overich waren (zijnde deur haer onbedacht toelaten te voren al van vele der voornaemste gesift) ooc in hande gekregen; En daeruyt verscheyde stoffen in een boec van meer andere zijnder eygen aenteyckeningen overgedragen: En onder anderen ettelicke gedachtenissen van watermolens en ander cam en staefwerc, dat wij t’ zijnder tijt en plaets hier of elders menen op te geven. Van welke aenteykeningen Beecmans, ons afschrift toegesonden wesende, vonden daer onder dit verhael van hem Beecman: Hout is meer dan viermaal sterker dan syn geclooft vierendeel Stevin heeft een voorstel geschreven aen de Dycgraef en Heemraden van Schielant, ter occasie vande Meule te Cralingen’

[Note by Simon Stevin]

Book XI, fol. 37, see also: *Principal Works of Simon Stevin* v, p. 204:

‘Angesien veel Huysen, Schansen ende Steden, gebout worden op bedijckte landen, alwaer kennis vande gemene eygenschap der schuyring vorderlick is, soo sal ic nu daer af als totten huysbou behoorende wat seggen’



# Lists of contents





## Appendix F

### Beeckman's list of manuscripts by Simon Stevin

Middelburg, Zeeuwse Bibliotheek, HS. 6471, folio 194 recto

Loci communes font formae omnium rerum agendorum virtutum aliorumque communium, thematum, communes, quae fece in usum variasque rerum humanarium aculutarum causas incidere possunt [...] 1604

*Folio 194 recto*

'Tgene ick te Hasersouw onder Simon Stevyns nagelaten pampieren gesien hebbe den 15en Junij 1624, is dit volgende:<sup>75</sup>

- [1] – Van de Singconst.
- [2] – Van de Spaylhouw.
- [3] – Van de geduerighe verlegginghe des chrychsvolckx.
- [4] – Van de weerdicheden der cryghsampten.
- [5] – Oorden der verkiesinge.
- [6] – Calis int groot afgebeelt.
- [7] – Cryghssaken.
- [8] – Tegen verdruckingen.
- [9] – Veltslachoordenigh.
- [10] – Pyckschansinghe.
- [11] – De toutes reigles doubles sans y user de regle renverse invention de Son Excellence.
- [12] – Aenhanck der dwaelderloop.
- [13] – Snellij Cometarum apotelesmata.
- [14] – Chryghskonst, seer veel daervan.
- [15] – Verscheyden chryghtochten dadelick van hem gesien ende geordineert.
- [16] – Van Watermolens ende Pompen.
- [17] – Syn Excellenties teyckeninghen ende schrift.
- [18] – Santplate te danzick.
- [19] – Metaelproef.
- [20] – Burgerlick Levens Aenhanck.
- [21] – Conste der disillatien van ander schrift.
- [22] – Cleytreckink kort.
- [23] – Ordeningh der steden.
- [24] – Solders ende overwelfsels.
- [25] – Metselreye, timmerinck, smedingh, roock.
- [26] – Huysbouw.
- [27] – Van Steygers.
- [28] – Van Cammen en Staven'.

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<sup>75</sup> The numbering is by De Waard. Beeckman, who collated the titles, wrote them in a continuous text rather than as a numbered list.

# Appendix G

## Isaac Beeckman: Hoofdstucken ende deelen des Huysbouws

Middelburg, Zeeuwse Bibliotheek, HS. 6471, folio 233 recto - 233 verso

Loci communes font formae omnium rerum agendorum virtutum aliorumque communium, thematum, communes, quae fece in usum variasque rerum humanarium aclutarum causas incidere possunt [...] 1604

[In margin: Architecturae Domesticae Stevini Synopsis]

[Above text: Hoofdstucken Ende Deelen Des Huysbouws]

### I Hoofdstuck Vande lycksydicheyt des gebous

- 1 Van de bepalinge ende beschryvinge der lycksydicheyt
- 2 Vande lycksydige ordeningh der Romeynsche burgerlicke huysen en gemeene gestichts
- 3 Van de lycksydige ordeningh der Grieksche burgerlicke huysen

### II Van de onderaertsche werken

- 1 Van de grondtvestingh
- 2 Van de bornputten, pompen, santboringh
- 3 Van de regenbacken
- 4 Van de heymelicken
- 5 Van de kelders

### III Van de gevels

- 1 Van de freyten der gevels
- 2 Van de deuren en veynsters, die in de gevels commen
- 3 Van de waterlysten
- 4 Vant cieraet der gevels

### IV Van de steygers

- 1 Van de bequamheden ende onbequamheden dieder in stoff van steygers dient bedocht te worden.
- 2 Van de bequamheden ende onbequamheden der wentesteygers
- 3 Van de steecksteygers

- 4 Inhoudende voorbeelden van gemeyngde steegers na bedwongen plaets.
- 5 Van eenighe telkonstighe rekeningen, die in de stof van oirdening der steegers konnen te pas comen.

v Van de solders en overwelfsels

- 1 Van de steene overwelfsels
- 2 Van houtse solders
- 3 Van gepleysterde solders
- 4 van de daken

vi Van de oirdeningh der deelen eens huys als der camers lichplaetsen, gaelderyen, hoven blocken ende ten laesten der deelen welcke een camer heeft

- 1 Van de verwoeginge der lichtplaetsen eens huys
- 2 Van de verwoeginge der lichtplaetsen eens blocks burgerlicke huysen
- 3 Van de verkiesinge der camers of percken, elck tot haer gebruyck met insicht door welcke dat men bequamelick gaen mach of behoort te gaen om tot de andere te comen en welcke niet.
- 4 Van de verwoegingh der camers of percken, die samen het het huys maken
- 5 Van de verwoegingh der hoven
- 6 Van de verwoegingh der gaelderyen
- 7 Van de verwoegingh der stucken, die in camers of perecken vereyscht zijn, als steegers, portalen, schoorsteen, schryfkasten, heymelicken, fonteynen, brandinghplaetsen, regenpypen, leuven

vii Van de oirdeningh der steden

- 1 Van de middelen daer men groote en machtige steden door maken can
- 2 Van de verkiesingh der plaetsen, daer men de steden wilt leggen
- 3 Van de form der steden
- 4 Van de sluysen
- 5 Van de havens
- 6 Van de hoofden
- 7 Hoe men omt verdrincken der steden te voorkomen, bedyckte landen hoger doet wassen die daerdoor oock vruchbaerder syn

Verscheyden aenteyckeningen

- Van Metselarye
- Van Timmering
- Van Smedingh
- Van Rook

Aenteyckeningen op Serlyns en andere

# Appendix H

## Hendrick Stevin: contents of manuscript 'Vande oirdening der Steden'

The Hague, Koninklijke Bibliotheek, 128-A-9-II, folio 2 recto

Eenighe Stucken der Chrijchconst Beschreven deur Simon Stevin  
In sijn leven quartiermeester General en Ingenieur vant leger mitsgaders Superintendent Raet  
en rekenmeester vande Domeinen van Prince Maurits Hoochlofficker Gedachtenis

*Folio 2 recto*

VANDE OIRDENING DER STEDEN

Cort begriip

Angesien uijt vergaring van veel huijsen, Steden commen die wel veroident sijnde tot groote bequamheijt en gerief der huijsen strecken, soo is de oirdening der steden stof totten huijsbou' gehoorende, daerom sal icker afseggen als volcht,

Ten 1 en vande middelen daermen groote machtige steden door maken can.,

Ten 2 en vande verkiesing der plaetsen daermen de Steden wil leggen.,

Ten 3 en vande form der Steden.,

*[Van looven voor de Huijsen op beyden sijden der straten]*

*[Vande lycksydighe vergrooting der stadt]*

Ten 4 en hoemen om tverdrincken det Steden en Dorpen te voorcommen, bedijckte landen doet hoogen wassen, die daer me ook veel vruchtbaerder zijn.,

Ten 5 en hoemen twater van stilstaende stinckende grachten can ververschen.

## Appendix I

# Hendrick Stevin: ‘I Onderscheyt vande oirdeningh der steden’ and ‘Byvough der Stedenoirdeningh, vande Oirdeningh der Deelen eens Huys met ‘t gheene daer ancleeft’.

Hendrick Stevin, *Materiae Politicae. Burgerlicke Stoffen*, Leiden 1649

### I ONDERSCHEYT VANDE OIRDENINGH DER STEDEN

*p. 6*

#### *Cortbegryp*

Dit eerste Onderscheyt sal 8 hooftsticken hebben als volgt

Het 1 Hooftstick vande Middelen daermen groote machtige Steden deur maken can

Het 2 Hooftstick vande verkiezing der plaets daermen Steden wil leggen

Het 3 Hooftstick van de bepaling en beschrijving der Lijcksijdeicheyt

Het 4 Hooftstick vande form der Steden

Het 5 Hooftstick vande oirdeningh der Burgerlicke Huysen eens blockx

Het 6 Hooftstick van Looven voor de huysen op beyde zijden der Straten

Het 7 Hooftstick vande Lijckzijdige vergrooting der Stadt

Het 8 Hooftstick hoemen om ‘t verdrincken der Steden en dorpen te voorkomen, bedijckte landen doet hooger wassen die daerme oock veel vruchtbaerder zijn.

### BYVOUGH DER STEDENOIRDENINGH, VANDE OIRDENINGH DER DEELEN EENS HUYS MET ‘T GHEENE DAER ANCLEEFT.

*p. 40:*

Cort Begryp der Byvough [...] En sal desen Byvough veertien Hooftsticken hebben

Het eerste Hooftstick Vande Lijckzijdige oirdening der Romeynsche en Grieksche Burgerlicke huysen

*[Vande Lycksydighe Oirdeningh der Romeynsche Burgerlicke Huysen]*

*[Vande Lycksydighe Oirdening der Grieksche Burgerlycke huysen]*

Het tweede vande vervouging der Lichtplaetsen

Het derde vande Looven der lichtplaetsen

Het vierde van de vervougingh der camers of percken die t’samen het heel huys maken.

Het vijfde deur welcke kamers of percken datmen bequamelick gaen mach om tot d’ander te comen, deur welcke niet.

Het seste vant open en toegaen der deuren, mitsgaders ghedachtenissen op sloten en sleutels.

*[Ghedachtenissen op sloten en sleutels]*

Het sevenste vande voordeelen en achterdeelen der stoven

*[Voordeelen]*

*[Achterdeelen]*

Het achtste van Schoorstenen, te weten om die te veroirdenen datse wel roock trecken.

*[1. Punt vande Spiegbelingh des roockz]*

*[2. Punt. Vande verscheyden middelen diemen tot elke plaetsen ghebruycket]*

Het negenste vande onderdeelsche wercken als Bornputten, Regenbacken, heymelicken en kelders.

*[En eerste van Bornputten]*

*[Nu vande Regenbacken]*

*[Vande Heymelicken]*

*[Vande Kelders]*

Het thiende vande daken.

Het elfde vant Cieraet der gevels

*[Vant gebruyck der pilaren tot gerief]*

*[Vant gebruyck der pilaren tot cieraet]*

Het twaelfde Inhoudende Sommighe gheschillen

*[Het 1 Geschil op maten der pilaren met baer anclaving]*

*[Het 2 Geschil opt gebruyck der pilaren tot cieraet]*

*[Het 3 Geschil op beeldich cieraet, op nitsen, en op Clocken, [en op Acroteria of pedestalen]]*

*[Het 4 Geschil van borstweren, daer daken oprusten.]*

*[Het 5 Geschil op hoochden, langden en breedden der camers]*

Het derthiende Hooftstick inhoudende ghedachtenissen opt model vant huys.

*[Vande lijcksydicheyt]*

*[Vrijlicht]*

*[Dack]*

*[Looven]*

*[Steygers]*

*[Vande vasticheyt vant huys in syn gebeel]*

Het 14 vande manier des Gebous, om versekert te sijn tegen brant.

*[Vande stof der cassynen van deuren en veinsters met die der luycken]*

*[Nu van de verscheyde manieren van 't open en toegaen der luycken]*

*[Van 't Shuyten der veinsters]*

*[Het 4 Lidt vande Keyckveinsters]*

[Vande diepte der Bornputten.]

## Appendix J

### Hendrick Stevin: Tytels en cortbegrypen, vanden Huysbou

H. Stevin, *Materiae Politicae*. Burgerlicke Stoffen, Leiden 1649, pp. 144-147:

VAN DEN HUYSBAU Vervangende mede 't geen noodich is tot bevordering der welvaert, behoudenis en geduerige verbetering van Steden en Landen na des Authuers gevoelen: waerby noch gevoucht is Weechdadelichen Handel van Cammen en Staven in Watermolens en cleytrecking

#### Cortbegrip

Dese Huysbou sal hebben 16 Hooftsticken als volgt:

*1 Hooftst. vande lijckzydicheyt der gebouwen, 't welck heeft 3 leden*

- 1 Lidt vande bepaling en beschryving der lijcksijdigheyt
- 2 Lidt vande lijcksijdige oirdening der Romeinse burgerlicke huysen en gemeene gestichten
- 3 Lidt vande lijcksijdige oirdening der Grieksche burgerlicke huysen

*2 Hooftst. Vande onderreertsche wercken, 't welck heeft 6 leden als volgt*

- 1 Lidt vande grontvasting
- 2 Lidt van bornputte, boring en pompen.
- 3 Lidt vandes schrijvers vont om diep onder water te booren
- 4 Lidt vande regenbacken
- 5 Lidt vande heymelicken
- 6 Lidt vande kelders

*3 Hooftst. Vande gevels. Dit hooftstick sal inde 6 volgende deelen verdeelt worden*

- 1 Deel Vande freyten der gevels
- 2 Deel Van deuren en vensters die in de gevels staen, metten aencleven van dien: 't welck heeft 5 leden
  - 1 Lidt van de stof der cassynen van deuren en vensters met die der luycken
  - 2 Lidt vande verscheyden manieren vant open en toegaen der luycken
  - 3 Lidt vant sluyten der vensters
  - 4 Lidt vande kijckveinsters
3. Deel Vande waterlijsten
4. Deel Vant cieraet des gevels
5. Deel Vande looven der gevels
6. Deel Vande gevels van hout met steen gemengt.



4 *Hoofst. Vande steegers, 't welck heeft 5 leden*

- 1 Lidt vande bequaheden, en onbequaheden dieder in stof van steegers dienen bedocht te wesen
- 2 Lidt van de bequaheden en onbequaheden der wentelsteegers
- 3 Lidt vande steeck steegers
- 4 Lidt inhoudende gemengde steegers na bedwongen plaetsen
- 5 Lidt van eenighe telconstige rekeningen die in stof van oirdening der steegers bequamelick connen gebruyckt worden

5 *Hoofst Van houten solders*

6 *Hoofst. vande manier des gebouws om versekert te zijn tegen brandt*

7 *Hoofst. Vande steenen overwelfsels, 't welck heeft 3 leden*

- 1 Lidt van de eygenschappen en voordeelen der steene overwelfsels en de beschrijving van haar vervouging tot decksels der camers
- 2 Lidt van vier gemeene regels op bogen en overwelfsels
- 3 Lidt van eenige aenteyckeningen op bogen en overwelfsels

8 *Hoofst. Vande daken*

9 *Hoofst. Vande oirdening der deelen eens Huys met datter aencleeft, 't welck heeft 10 Leden*

- 1 Lidt vande vervouging der lichtplaetsen
- 2 Lidt vande looven der lichtplaetsen
- 3 Lidt vande vervouging der camers of percken en ander noortlichkeiten die 't samen het huys maken.
- 4 Lidt deur welcke percken datmen bequamelick gaen mach om tot d'ander te comen, deur welcke niet
- 5 Lidt vant open en toegaen der deuren
- 6 Lidt van gedachtenissen op sloten en sleutels
- 7 Lidt van de Stoven
- 8 Lidt van Schoorstenen; te weten om die te veroirdenen datse wel roock trecken
- 9 Lidt hoemen de carpetten ande deuren en stijlen sal hechten sonder nagelen om die te connen afdoen alsmen wil,
- 10 Lidt vande vervouging der Hooven met haer looven tot bevrijding

10 *Hoofst Vande oirdening der kercken en Tuychbuysen*

11 *Van verscheyden aenteyckeningen, angaende metselrie, timmering en smeding: 't welck heeft 3 deelen*

- 1 Deel Van metselrie, en heeft 5 leden
  - 1 Lidt van backsteen, hartsteen en tegelen
  - 2 Lidt van calckmortel en trast

- 3 Lidt van verbant der backsteen en hartsteen
- 4 Lidt van hooge sware metselrie
- 5 Lidt waerom nieuwe metselrie tegen oude gewrocht altijt bevonden wat te sincken en hoemen dat voorcommen can
- 2 Deel Van timmering, 't welck heeft 6 leden als volgt:
  - 1 Lidt vande soorten van hout diemen in een landt gebruyckt als hier
  - 2 Lidt vander timmerlien hupsche reetschappen die een seltsaem werck doen
  - 3 Lidt vande vervouging der corbelen en van stooven
  - 4 Lidt vant lassen der balcken
  - 5 Lidt reden waerom het dack van de sael inden Haeg so lange duert
  - 6 Lidt vande rusting der daken op de muerplaten en echting des selfs solders ande muerplaten
- 3 Deel. Van Yserwerck en van smeding

12 *Hoofst. Vande bechting van hout en steen*

13 *Hoofst Inhoudende sommige geschillen*

- 1. Geschil op maten der pilaren met haer aencleving
- 2. Geschil opt gebruyck der pylaren tot cieraet
- 3. Geschil op dicte en swaerte van pilaren
- 4. Geschil op architraven
- 5. Geschil op clocken
- 6. Geschil op Acroteria of pedestalen
- 7. Geschil op uytsteecksels der gevels
- 8. Geschil op beeldich cieraet en nitsen
- 9. Geschil van borstweeren daer daken op rusten
- 10. Geschil op hoogte der camers na reden haerder langde en breedte

14 *Hoofst Vande oirdening der burgerlicke huysen eens blocx*

15 *Hoofst. Vande oirdening der Steden: 't welck heeft 13 leden*

- 1 Lidt vande Middelen daermen groote machtige Steden deur maken can
- 2 Lidt vande verkiesing der plaets daermen Steden wil leggen
- 3 Lidt vande form der Steden
- 4 Lidt van looven voor de huysen op beyde zijden der Straten
- 5 Lidt vande lijkzijdige vergrooting der Stadt
- 6 Lidt hoemen stilstaende stijckende grachten can verversschen
- 7 Lidt loopende een rechte rivier voor by een Stadt, deselve soo te leijen datse rontsom de Stadt loopt.
- 8 Lidt vande hoofdens der havens
- 9 Lidt dat grachten int sant dieper connen gegraven worden deur santtrecking onder water, dan int drooge te graven deurt behulp van hoosing.
- 10 Lidt van crammen

- 11 Lidt te maken dichte crammen en dijcken daer op beyde zijden water tegen comt op d'eene zijde hoogst
- 12 Lidt houten dam te Willemstadt.
- 13 Lidt hoe men om 't verdrincken der Steden en dorpen te voorkomen, bedijckte landen doet hooger wassen die daerme oock veel vruchtbaerder zijn.

16 *Hoofst. Vande waterschuyring*

17 *Hoofst. Inhoudende sommige vonden des schrijvers tot verbetering ettelicker Steden, te weten Dantsick, Exbing, Breunsberg, Rijnberck, Deventer en Zutphen, Schiedam en Lingen.*

Waerby noch gevought is

*Weechdadelicken handel van cammen en staven in Watermolens en cleytrecking*

# Appendix K

## Ed Taverne: Architecturae domesticae stevini synopsis

Reconstruction of ‘Van de oirdening der Steden’, ‘Byvough der Stedenoordening’, and of Huysbou by Ed Taverne: ‘Architecturae Domesticae Stevini Synopsis’, appendix

### *I Van de oirdening der steden*

Hoofdstuk 1 Van de middelen daer men groote en machtige steden door maken can.

Hoofdstuk 2 Van de verkiesingh der plaetsen, daer men de steden wilt leggen.

Hoofdstuk 3 Van de form der steden.

- Van Looven voor Huysen op beide zijden der straten
- Vande Lycksydighe vergrooting der Stadt

Hoofdstuk 4 Hoemen twater van stilstaende stinckende grachten can ververschen.

Hoofdstuk 5 Hoe men omt verdrincken der steden te voorkomen, bedyckte landen hoger doet wassen die daerdoor oock vruchbaerder syn.

### *II Byvough der Stedenoordening*

Hoofdstuk 1 Van de verkiesinge der camers of percken, elck tot haer gebruyck met insicht door welcke dat men bequamelick gaen mach of behoort te gaen om tot de andere te comen en welcke niet.

- Van de verwoegingh der camers of percken, die samen het huys maken
- Van de verkiesinge der camers of percken, elck tot haer gebruyck met insicht door welcke dat men bequamelick gaen mach of behoort te gaen om tot de andere te comen en welcke niet.

Hoofdstuk 2 Van de verwoegingh der lichtplaetsen eens huys.

Hoofdstuk 3 Vande looven der lichtplaetsen.

Hoofdstuk 4 Van ‘t onderertsche werk als Bornputten, regenbacken, heymelicken en kelders.

- En eerst van bornputten
- Nu van de regenbacken
- Vande Heymelicken
- Vande kelders

Hoofdstuk 5 Vande Daken.

Hoofdstuk 6 Van Cieraet des gevels.

- Vant gebruyck der pilaren tot gerief
- Vant gebruyck der pilaren tot cieraet

Hoofdstuk 7 Vande manier des gebous om versekert te syn tegen brant.

Hoofdstuk 8 Inhoudende gedachtenissen opt Model vant Huys

### III Huysbou

Hoofdstuk 1 Vande lycksydicheyt des gebous.

- Van de bepalinge ende beschryvinge der lycksydicheyt
- Vande lycksydige ordeningh der Romeynsche burgerlicke huysen en gemeene gestichts
- Van de lycksydige ordeningh der Grieksche burgerlicke huysen

Hoofdstuk 2 Van de oirdeningh der deelen eens huys als der camers lichplaetsen, gaelderyen, hoven blocken ende ten laesten der deelen welcke een camer heeft.

- Van de verwoeginge der lichtplaetsen eens blocks burgerlicke huysen
- Van de verwoeginge der lichtplaetsen eens huys
- Van de verwoegingh der gaelderyen
- Van de verwoegingh der stucken, die in camers of perecken vereyscht zijn, als steegers, portalen, schoorsteenen, schryfkasten, heymelicken, fonteynen, brandinghplaetsen, regenpypen, leuven
- Vande oirdeningh der kercken en tuychhuysen

Hoofdstuk 3 Van de onderaertsche werken

- Van de grondtvestingh
- Van de bornputten, pompen, santboringh

Hoofdstuk 4 Van de gevels.

- Van de freyten der gevels
- Van de deuren en veynsters, die in de gevels commen
  - Van de stof der cassynen van deuren en veinsters met die der luycken
  - Vande versheyden manieren vant open en toegaen der luycken
  - Vant sluyten der veinsters
  - Vande kijckveinsters
- *Van de waterhysten*
- Vant cieraet der gevels
  - Het 1 Geschil op maten der pilaren met haer ancleving
  - Het 2 Geschil opt gebruyck der pilaren tot cieraet
  - Het 3 Geschil op beeldich cieraet, op nitsen, en op Clocken, [en op Acroteria of pedestalen]
  - Het 4 Geschil van borstweren, daer daken oprusten
  - Het 5 Geschil op hoochden, langden en breedden der camers

Hoofdstuk 5 Van de steegers.

- Van de bequamheden ende onbequamheden dieder in stoff van steegers dient bedocht te worden.
- Van de bequamheden ende onbequamheden der wentesteegers
- Van de steecksteegers
- Inhoudende voorbeelden van gemeyngde steegers na bedwongen plaets.
- Van eenighe telkonstighe rekeningen, die in de stof van oirdening der steegers kunnen te pas comen.

Hoofdstuk 6 Van de solders en overwelfsels.

- Van de steene overwelfsels
- Van houte solders
- Van gepleysterde solders

Hoofdstuk 7 Metselrye, timmerinck, smedingh, roock.

# Glossary of architectural terms

croteria [H <sup>1</sup> : akroterie]	– decoration of corner capital in temple
balck	– beam
barder(s) [H: bord/bort]	– board(s)
bebardering [Stevin: lambecering]	– boarding
blinde [H: blind]	– shutter
blocx [H: blok]	– block of houses surrounded by three or four streets
	– bastion
bolwerck	– water well (spring wells)
bornput	– well drilling
bornputten	– parapet
borstweer [H . punt weggehaald:borstwering]	– pantry
bottelrie [H: bottelarij]	– architect
boumeester [Stevin: architect]	– fireplace
brandinghplaets	– private house
burgerlicke huys	– Tournai lime, burnt lime
calck, doornixen [H: kalk]	– Leyden lime, burnt lime
calck, Leydts [H: kalk]	– Maas lime, burnt lime
calck, Maes [H: kalk]	– room
camer	– see bosel: hollow, carving in ornament
cantrabosel [=contrabosel]	– console [with ornament]
cardous [H: kardoes]	– cupboard, case
cassen	– (window) frame
cassynen	– ornament
cieraet	– dredging of clay
cleytrecking	– curved frontispiece, fronton
clocken [Stevin: frontispice]	– clinker
clyckaert	– office [derived from comptoir]
contoir, comtoir	– cross-bar window
cruyscassyn	– cross-roof
cruysdak	– cross-gallery
cruyslooven	– roof
dak	– ceiling
decksel(s)	– perspective
deursichtighe	– double-chamber (in harbour)
dobbel houwer	

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<sup>1</sup> source: Dr. E.J. Haslinghuis, *Bouwkundige termen. Verklarend woordenboek der westerse architectuurgeschiedenis. Bewerkt door F.H.M. Bosch-Kruimel, H. Janse, A.F.E. Kipp, N.C.G.M. van de Rijt, E.M. van Thienen*, Utrecht/Antwerpen, 1986

erven	– plots
everedenheyt [Stevin: proportione]	– proportion
fonteyn	– drinking fountain
freyten [H. freit]	– window pier, buttress
gaeldery	– gallery
gevels	– façades
ghesticht	– building
goote [Stevin: rioler]	– gutter, sewer
gordinen [H: gordijn]	– curtain
grondvastigh	– foundations
grontteykeningh	– ground-plan, ichnographical projection
[Stevin: Ichnographia]	
groote saal	– main hall
heymelicken [H: heimelijkheid]	– privy, convenience
hof	– garden
huysbouwing [Architecte weghalen]tura]	– architecture
huysinghe	– house
juweelkamer	– treasury
kelder	– cellar
kijckveinster	– oriel, oriel window baywindow
kist	– caisson
leufvloer	– pavement
lichtplaets [Stevin: atrium]	– courtyard, atrium
lijcksijdicheyt	– equilateral symmetry (mirror-symmetry)
loof, looven	– outshot, gallery
luyck	– shutter
metselarye	– masonry
model	– architectural model, maquette
moluren [H: molure]	– mouldings, profile
moorters	– mortar
morsboek	– scullery
mortel [H: mortel]	– mortar
nits	– niche
oirdening	– design, lay-out
oorgat	– hinged, raisable plank in road surface bridge
overwelfsel[s]	– vault[s]
pannen	– clay tiles on roof
perck	– field, compartment
pilaer, pylaer	– column
plaets	– court, courtyard
pleysteringh	– plastering
puntsijden [Stevin: facen]	– faces of bastion
quelm sandt	– quicksand
reetschap [Stevin: instrument]	– instrument, tool
regenback [H.: regenbak]	– cistern, waterreservoir / container
rondbosel	– see, bosel
rooleijdack	– roof with red slates
saal [H: zaal]	– hall, grand-hall

saemmaticheyt	– proportion (but in Stevin's interpretation symmetry)
saemschicking	– composition
santboring	– drilling in sand in order to make a well
saudure [H: soldeer]	– solder
schoorsteen	– chimney
schoorsteenbuis	– flue
schrijffercken/kasten	– office, studio
schueringh	– scouring
secreet [H: secreet]	– convenience, privy
sichteynder [Stevin: Horisontalis]	– horizon
solder	– ceiling
spiegelherst [H: hersen]	– resin
spilsluys	– pivotted sluice
stantteykeningh	– elevation, orthographical projection
stedenoirdening	– town planning
steen – Bentemer [H: Bentheimer]	– Bentheim sandstone
steen – Walschbrabants	– Walloon Brabant stone
steen – Perpen [H: Perpeyn]	– Perpen stone
sterctebou	– fortification
steygers [H: trappen]	– stairs
stof [Stevin: materia]	– subject, matter
stofroersel des eertcloots	– the movement of matter on the planet
stoof [H: stoof]	– separated heated room
stootvougen [Stevin: joinctures]	– vertical joint
stouplaets [H: stoep]	– stoop
strijckweer [Stevin: flank]	– flank
stryckhout [vergl. H: strijkbalk]	– small border joist
sypback, suyverback	– waterfilter
tegel [H: daktegel]	– flat tile
timmering	– carpentry
trappen (Stevin: graden)	– scale, degrees
trast [H: tras]	– trass
turfbacken	– peat container
tuychwerckelicke consten [Stevin: mechanicus artibus]	– mechanics
uijthoosen	– bail
veinster	– window
verbruynde	– darkened
verschaeuwing [Stevin: Schenographiam]	– perspective, scenographical projection
vertreckamer	– living room
vervoeginge	– disposition
voorloof [Stevin: vestibulum]	– outshot or gallery
vorstelyck huys	– palace
waterlyst [H: waterlijst]	– label moulding, dripstone
wellen	– welding iron
welsandt	– quicksand



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