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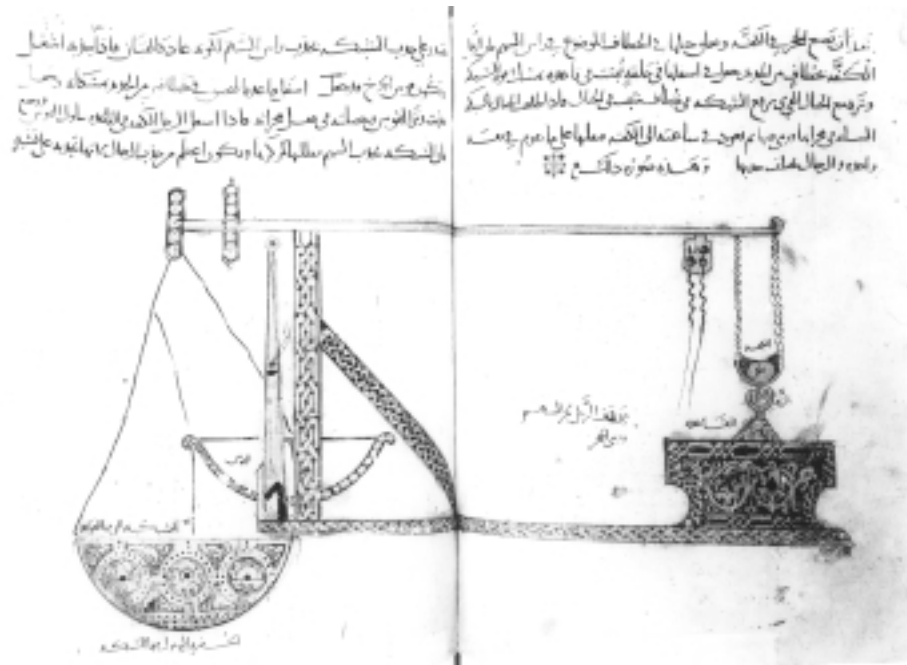
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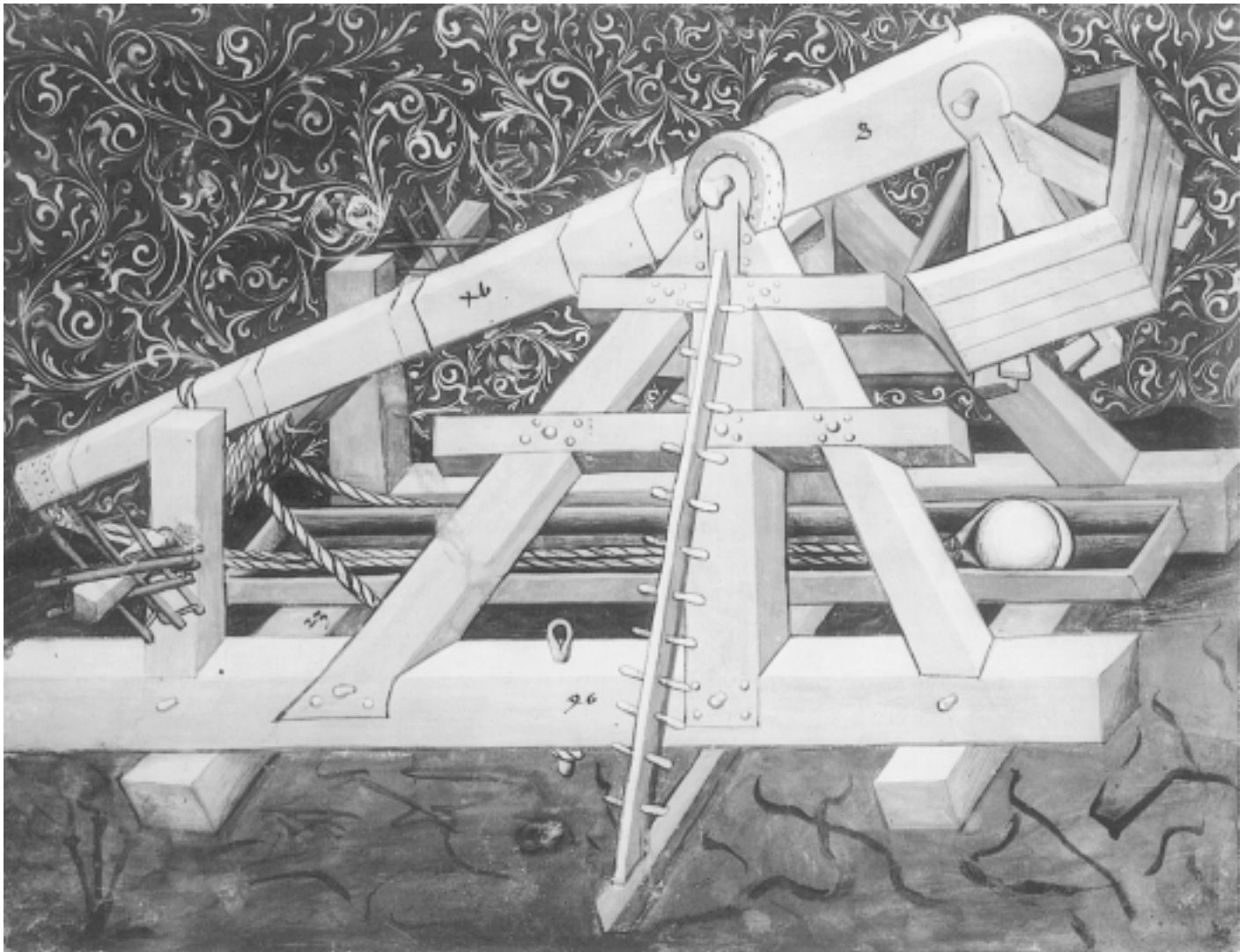
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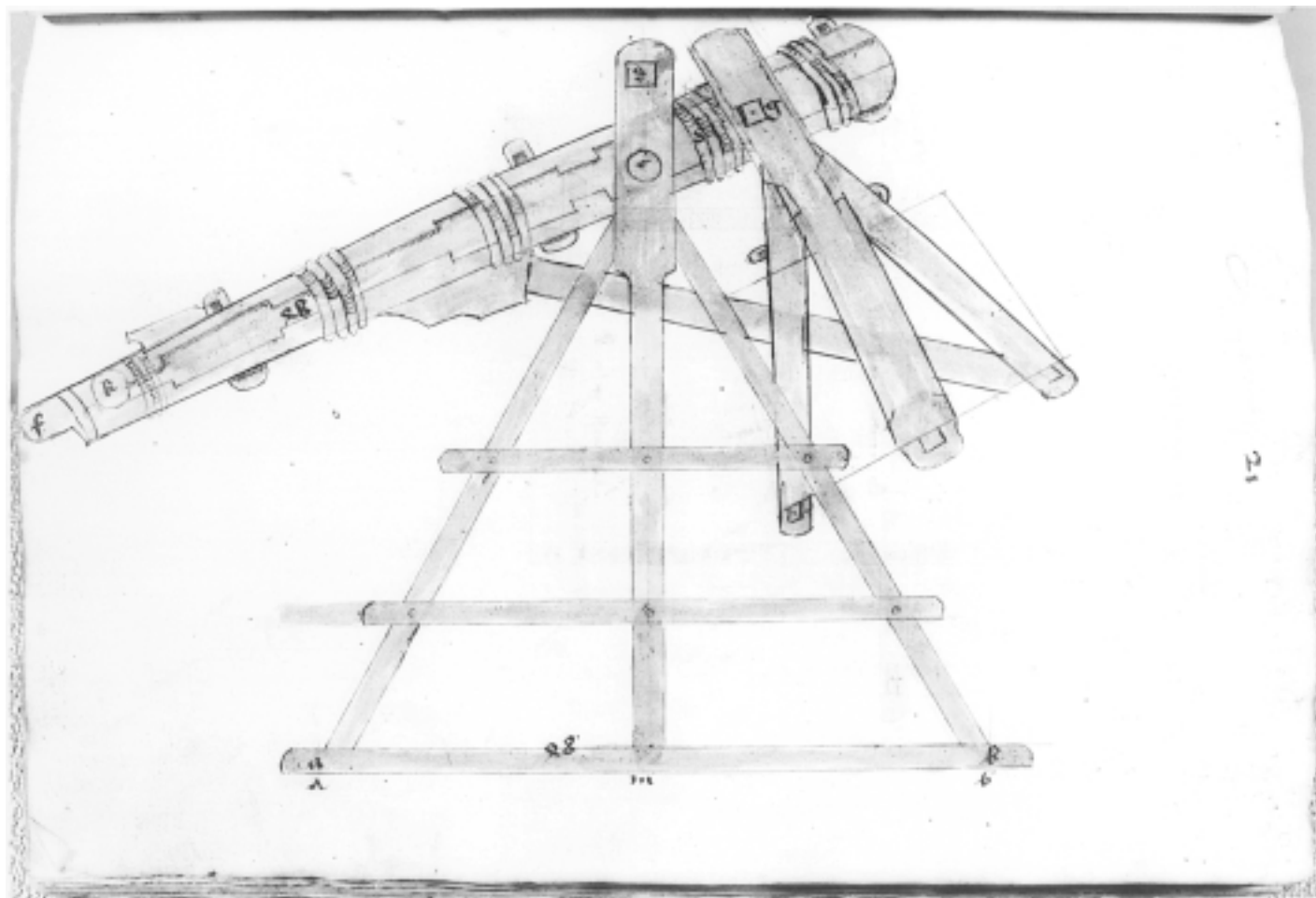
- 1 Tarsūsī, *Taḥṣīrah fī al-ḥurūb*, Oxford, Bodleian, MS Hunt. 264, fols. 134v–135r: Tarsūsī's counterweight trebuchet, the earliest extant illustration of a gravity-powered trebuchet, dating from ca. 1187. This machine, operated by a single man, served two functions: it was a medium-size trebuchet, having the throwing power of a "fifty-man" traction machine, and it functioned as a spanning device for a large siege crossbow, shown on the left. Captions read: *left (top to bottom)*, "the bow"; "the net which has in it bases [sic]" [stones]; "the hole in which the net [the counterweight] descends"; *center*, "the position of the man for hauling down the beam and shooting the stone"; *right (top to bottom)*, "the pouch"; "the stone"; "the U-bolt"; "the base."



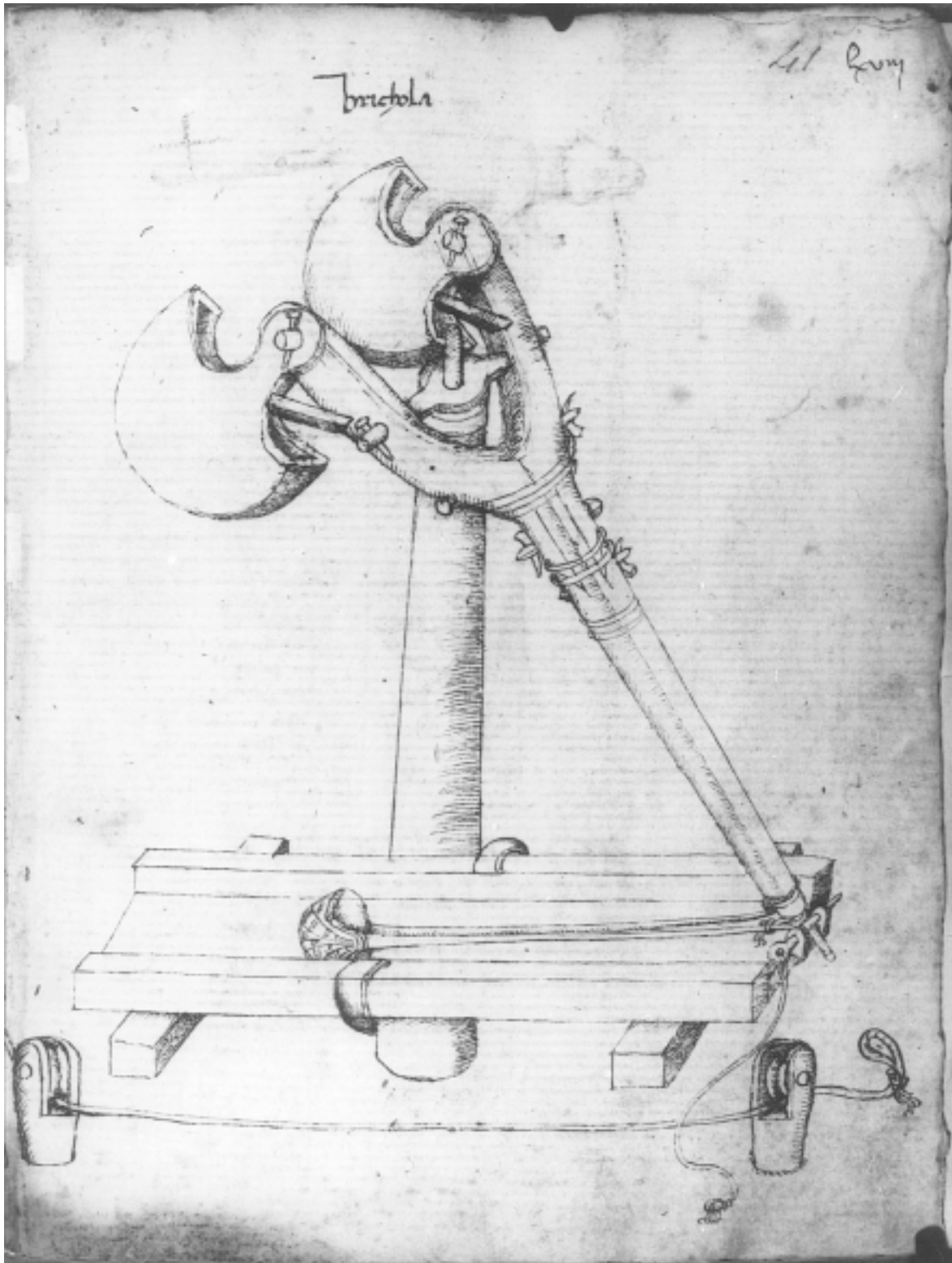
- 2 Rashīd al-Dīn, *Jamī' al-tawārikh* (1306–1307), Edinburgh, Edinburgh University Library, MS Arab 20, fol. 130v. The army of Maḥmūd ibn Sebuktegin captures the fortress of Muḥammad ibn Abū Naṣr Muḥammad in 1012. The operator of the counterweight trebuchet—depicted in Arab or Persian attire—is about to discharge the machine by striking a blow to the pin holding down the beam with his mallet. Bolts and metal plates create strong and effective joints on the framework of the machine and on the box holding the counterweight.



- 3 Conrad Kyser of Eichstätt, *Bellifortis* (ca. 1405), Göttingen, Niedersächsische Staats- und Universitätsbibliothek, Cod. MS philos. 63, fol. 30r. A large counterweight trebuchet. The main beam, counterweight box, sling, projectile, trough, windlass, and framework are all clearly visible with dimensions given for some of the component parts. The main beam measures 54 “workfeet,” or 15.55 m, with a throwing arm of 46 “workfeet,” or 13.248 m. The distance from the axle of the beam to the axle of the hinged counterweight box is 8 “workfeet,” or 2.304 m, dividing the beam in the ratio 5.75:1. A ratio of 6:1 is designated for the beam of a trebuchet in the Innsbruck manuscript of *Bellifortis* (Fig. 4), indicating that the dimensions given here may have been miscalculated. The trestle frame is composed of two linked supporting trusses, each forming an equilateral triangle with base and sides measuring 46 “workfeet,” or 13.248 m. The main axle is placed at the apex of the trusses 11.47 m above the ground. The main beam is banded by metal plates to withstand splitting, and the trusses of the framework are reinforced by horizontal braces that are bolted to the structure. The prong at the end of the long arm, which is essential for the release of the sling, is not depicted. Instead, both cords of the sling are incorrectly shown as being attached to a ring at the extremity of the long arm. This massive machine used a simple peg-and-hole, catch-and-trigger device to retain and release the beam. A hole drilled in the base of one of the trusses of the machine contains the peg. A restraining rope, attached to the base of the other truss, is drawn over the long arm of the beam at a point just above the windlass and is looped over the bottom end of the peg. When the peg is lifted out of its socket, the looped end of the rope is released, and the beam flies free. This type of machine was identified in Arabic historical sources as the Western Islamic trebuchet (*manjanīq maghribī*) and in Byzantine sources as the *helepolis* (city taker).



- 4 Conrad Kyeser of Eichstätt, *Bellifortis*, Innsbruck, Tiroler Landesmuseum Ferdinandeum, MS 16.0.7, fol. 21r. A large counterweight trebuchet noticeably different from its counterpart in the Göttingen manuscript of *Bellifortis* (Fig. 3). The main beam, counterweight box, and trestle framework are clearly shown with some components dimensioned. The main beam measures 56 “workfeet,” or 16.12 m, with a throwing arm of 48 “workfeet,” or 13.82 m. The distance from the axle of the beam to the axle of the hinged counterweight box is 8 “workfeet,” or 2.30 m, dividing the beam in the ratio 6:1. The trestle frame is composed of two linked supporting trusses, each forming an equilateral triangle with base and sides measuring 48 “workfeet,” or 13.82 m. The main axle is placed at the apex of the trusses 11.97 m above the ground. The rounded beam is composed of three spars of wood that are banded by rope and reinforced by three giant wooden pegs. A large strut is used to prop the counterweight box, and the truss of the framework is reinforced by horizontal braces that are bolted to the structure. The dimensions provided for this trebuchet revise some of the measurements given for the machine in the Göttingen manuscript of *Bellifortis* (Fig. 3). The measurement for the throwing arm in this illustration was originally written as “46,” corresponding to the figure given in the Göttingen manuscript, and was then changed to “48.” The draftsman realized that the dimensions for the machine in the Göttingen manuscript would not divide the beam in the ratio 6:1 and made the necessary corrections.



- 5 Mariano di Jacopo Taccola, *Liber Tertius de ingeneis ac ediftitiis non usitatis* (1433), Florence, Biblioteca Nazionale Centrale, Cod. palat. 766, fol. 41r. The “brichola” (*bricola*), a pole-framed trebuchet with two hinged counterweights. This machine was identified in Arabic historical sources as the Frankish or European trebuchet (*manjanīq franjī/īfranjī*). In Byzantium, the *bricola* was designated by the Latin loan word *praikoula* or *prekoula*.