BRUNELLESCHI'S HORIZONTAL ARCHES
AND RELATED DEVICES

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In order to achieve a pre-set external shape for the Cupola of Santa Maria del Fiore, Brunelleschi had to adopt a highly unusual form of masonry. In turn this required him to invent special equipment and techniques that would permit the realization of that form. Among those items were the horizontal arches in the Cupola; here an investigation of those arches leads to a suggested reconstruction of the ways in which they and other devices functioned in the day to day processes of construction.

"... nel murare la pratica insegna quello che si ha da seguire." 1

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1 CESARE GUASTI, La Cupola di Santa Maria del Fiore, Firenze, Barbèra, Bianchi e Comp., 1857 [Reprinted: Bologna, Forni, 1974], p. 30. This passage concludes the 1420 Instructions for constructing the Cupola, Doc. 51, pp. 28-30. Guasti's version was derived from previously published sources. The original was discovered later by ALFRED DÖREN and published in his: Zum Bau der Florentiner Domkuppel, "Reper- torium für Kunstwissenschaft", XXI, 1898, pp. 249-262, and XXII, 1899, pp. 220-221. These Instructions, with some variant readings, are available in many editions, among the more recent: FRANK D. PRAGER and GUSTINA SCAGLIA, Brunelleschi: Studies of his Technology and Inventions, Cambridge (USA), MIT Press, 1970, pp. 139-140; ANTO-
The 1426 revision of the specifications for the construction of the Cupola of the Florentine Cathedral proposed the installing of "mattoni in atto d'archo" which were for the "perfection of the circle that goes round the external shell of the Cupola" ["per perfectione del cerchio che gira intorno la Cupola di fuori"]. These mattoni in atto d'archo were to be placed above the second walkway between the two shells, and presumably they constitute the first set of "horizontal arches" which still exists at the indicated level (Figs. 1 & 2). Though the published documents do not explicitly mention additional sets of such arches, eight more were built as the structure rose to its key ring (Figs 3 & 4). While most commentators have assumed that the arches have, and were meant by Brunelleschi to have, some structural function (for instance, tying the internal ribs together or helping to support the external shell), the very next passage in the specifications quite clearly indicated that the first set, at least, could be dismantled after the Cupola was finished ["si possa, fatto la Cupola, disfare detta aggiunta"]¹. If we are to take this passage seriously, and there is no reason to take it less seriously than any of the others, Brunelleschi did not intend the arches to be permanent, and we need to find some other, temporary function for them.

Moreover, Brunelleschi had designed, as we shall see, a highly unusual structure, one that in important respects was outside the mason's normal experience and training. In particular, the plans called for the laying of bricks in an unfamiliar way, easy enough to describe geometrically but not immediately reducible to practice. As both designer and chief engineer, Brunelleschi had to devise equipment, procedures and instructions for the masons to use, ones that would remain generally valid as the shells rose and curved inward towards the Cupola's vertical axis. Evidently he was successful, for on one occasion he could take on a whole new crew and put it to work with little difficulty. But it remains to clarify how that was possible.

¹ Guasti, La Cupola, p. 39. This and the following passage are from the 1426 revision, Doc. 75, pp. 39-40.
³ Notably, for instance, Piero Sanpaolesi in his important: La Cupola di Santa Maria del Fiore. Il Progetto, La Costruzione, "Opere d'Arte", Fasc. XI, Roma, R. Istituto d'Arheologia e Storia dell'Arte, 1941 [Reprinted with a few alterations and an introduction: Firenze, Edam, 1977]. See also the other literature cited below.
⁴ Guasti, La Cupola, p. 39.
⁵ Manetti, Vita: De Robertis-Tanturli eds., p. 96; Saalman ed., pp. 90-91.