

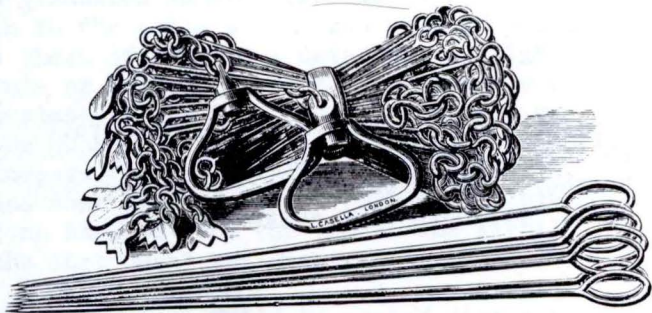
# THE COMPLEAT SURVEYOR



published to accompany a special exhibition at  
the Whipple Museum of the History of Science

# Other Surveying Instruments

The majority of eighteenth century surveys were commissioned by gentlemen farmers and landlords, anxious to obtain an accurate picture of their estates, and to assess the extent of their tenants' properties. These small, local maps, usually of enclosed farm land, were executed by the simplest methods, using the least expensive instruments - usually the chain and cross head.



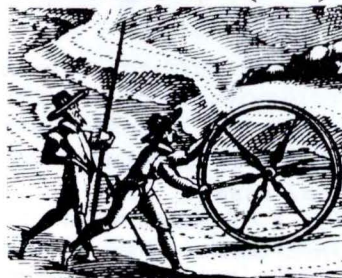
The Chain. C.F. Casella *Catalogue of surveying and drawing instruments* 1928.

Many eighteenth-century textbooks recommended the exclusive use of the chain, describing not only its use for distance measurement, but also methods for computing angles by the chain. As late as 1806 one author dismissed all other methods: 'There are instruments used in land-surveying for the purpose of taking angles such as the quadrant, theodolite, circumferentor etc., but as you may perform the business equally as well with the chain ... I shall decline saying anything with respect to their description.' (J. Cotes, *The Surveyors Guide*, London, 1806).

Others were less enthusiastic: 'This mode [of surveying by chain and cross] is used at present by many surveyors because there is no check whereby to discover their errors, which must be very great, if the survey is of any extent' (G. Adams, *Geometrical and Graphical Essays*, 3rd edn, ed. W. Jones, London, 1803).

Where chains were not the sole agent of the survey they were still essential for an initial base line measurement, both in small plane table, and national surveys. A 100 ft steel chain was commissioned from Ramsden for the calculation of the Hounslow Heath base in 1784. This base was measured three times - with glass rods, deal rods and the chain, which, supported on specially constructed posts and deal coffer, proved so accurate that two more were ordered for the work on Romney Marsh in 1787.

The surveyors wheel, variously known as a waywiser, perambulator, or more unusually a hodometer, was 'useful for measuring roads, commons and everything where expedition is required' (G. Adams. op. cit.) Comprising an iron shod wooden wheel, usually of half a pole circumference, with a dial mounted below the handle, the instrument recorded the distance travelled in poles, furlongs, and miles. Adams, who uses the term 'perambulator' to describe this instrument and 'waywiser' for 'a similar kind of instrument but generally applied to carriages for measuring roads or distance travelled', adds that 'the one objection is ... that it gives a measure somewhat too long by entering into hollows, and going over small hills ... but it may with propriety be asked whether any other method is less fallible?' (ibid).



The waywiser illustrated in Benjamin Bramer *Bericht zu jobson ..* (Cassel 1648)

The cross, or cross-head, was an essential part of the chain surveyors equipment - as Adams points out 'What has been denominated by many writers surveying by chain only, is in fact surveying by cross and chain, for it is necessary to use the cross, or optical square for determining perpendicular lines.' He illustrates the cross with open sights (see illustration) and the 'box type', of which a more sophisticated version was described by Jones in the 3rd edition of *Geometrical and Graphical Essays*. This instrument has a compass set over the tubular cross, which rotates on a graduated base, read by vernier to 5' of arc, providing the surveyor with 'a small theodolite, circumferentor and cross-staff all in one instrument.'

