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Jeremiah Dixon's Theodolite

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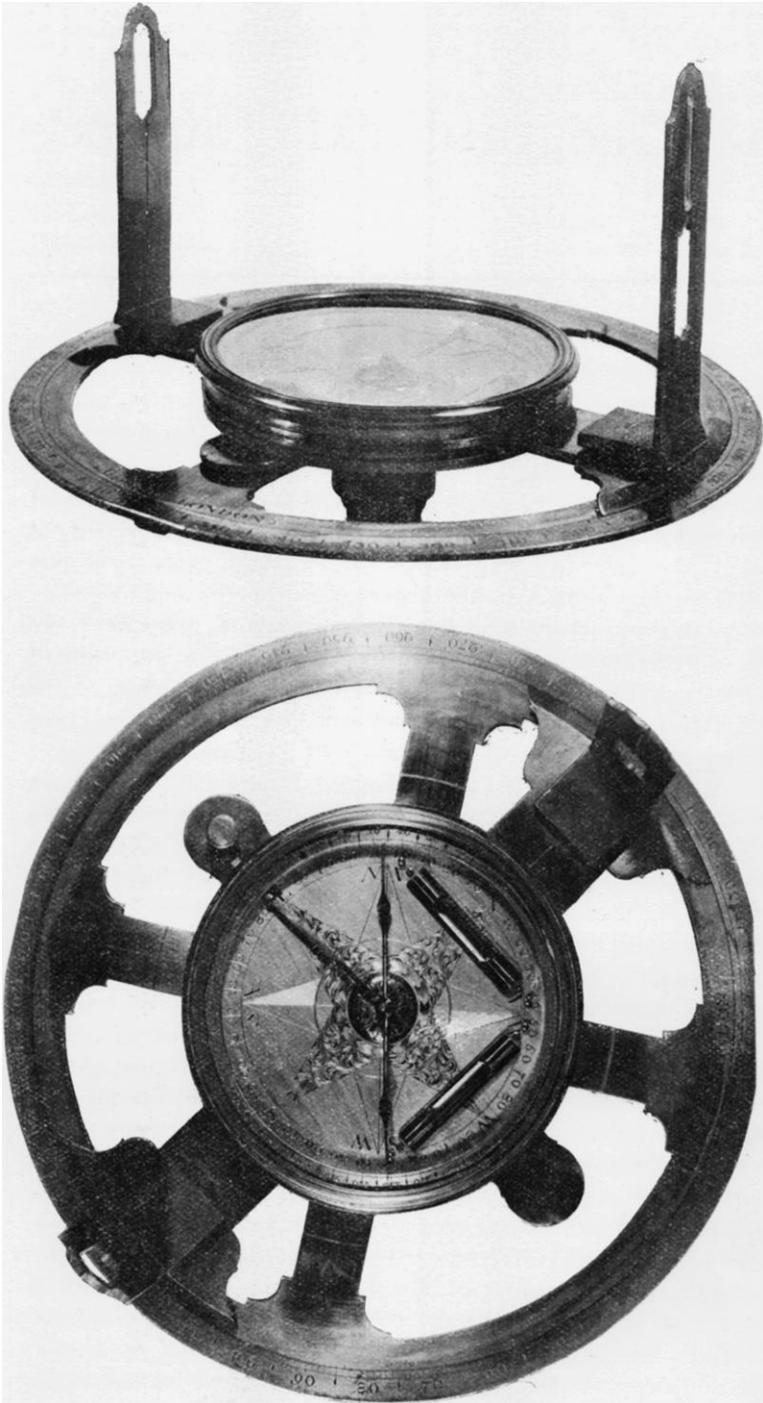
JEREMIAH DIXON'S THEODOLITE.

BY the generosity of Mr. Edward Dixon of Hull the Society's collection of instruments has been enriched with the fine early Theodolite which is figured in the plate opposite. It is of value as an admirable example of the work of George Adams, an instrument-maker of the middle of the eighteenth century; but more especially in that it was the property of Jeremiah Dixon, surveyor with Mason of the Mason and Dixon line which has so large a place in the history of boundaries and boundary disputes. The instrument came into the possession of John Dixon, the nephew of Jeremiah, and has descended in the family to Mr. Edward Dixon, the grandson of John Dixon, who has now presented it to the Society. There is a strong family tradition that the instrument was actually employed in setting out the Mason and Dixon line.

In a work on surveying instruments, of which the second edition was published in 1797, George Adams the younger gives a figure and description of the "Common Theodolite"—as distinct from the "Theodolite with Telescopic Sight"—which agrees in general with our instrument—though ours has only two sights, in place of the four of the "common theodolite," and in this respect is more like the Circumferentor, which does not, however, generally have the large horizontal circle. In the centre of the horizontal plate is a large compass, and the instrument is well adapted for measuring either horizontal angles or magnetic bearings with such degree of accuracy as can be obtained without optical aid. The graduated circle is 12 inches in diameter, divided into five minutes, and read by a single vernier. The levels are somewhat singularly placed on the beautifully engraved face of the compass.

A few notes on the complicated history of the Pennsylvania and Maryland boundary will not be out of place. They provide an instructive example of the difficulties which arise from imperfect description of a little-known territory. The Charter of Maryland, granted to Cecil, second Lord Baltimore, in 1632, included the whole of the peninsula east of the Bay of Chesapeake and the territory as far as 40° north *hactenus inculta*. The grant in 1681 to William Penn included the territory lying east of the Delaware River from 12 miles north of Newcastle to parallel 43°. The original grants thus overlapped, since Newcastle and even the city of Pennsylvania itself is south of parallel 40°. Moreover, the peninsula having

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Frontispiece.

JEREMIAH DIXON'S THEODOLITE.

been settled by the Dutch before effective occupation by Lord Baltimore, had, on the relinquishment of the Dutch claims, reverted to the Crown as not *hactenus inculta*, and had been later bought by William Penn. After more than half a century of dispute and a long suit in the Court of Chancery, an agreement was at last signed in 1760 with the following remarkable definition of the boundary :—

A due east and west line should be run across the peninsula from Cape Henlopen to Chesapeake Bay, and from the exact middle of this line should be drawn a line tangent to the western periphery of a circle having a radius of 12 statute miles measured horizontally from the centre of the town of Newcastle. From the tangent point a line should be drawn due north until it cut a parallel of latitude 15 miles due south of the most southern part of the city of Philadelphia, this point of intersection to be the north-east corner of Maryland. Thence the line should run due west on the same parallel as far as it forms a boundary between the two states.

This agreement represented a certain advance in the technique of boundary making. In half a century of argument it had been decided that it was improper to measure differences of latitude in miles ; and that the distances must be measured horizontally and not along the surface of the ground. But the agreement gave no precise definition of the centre of one town or the most southern point of another ; nor did it lay down whether a certain arm of Chesapeake Bay should be reckoned as part of the bay or not.

The main difficulty of the Commissioners, however, having settled the middle point of the transverse line, was to cut a tangent to the circle about Newcastle ; and after two expensive attempts had failed the proprietors were compelled to call in the help of Charles Mason and Jeremiah Dixon, the first an astronomer and assistant to Bradley, the second a surveyor of Cockfield, in Durham—both of whom had been employed by the Royal Society to observe the transit of Venus in 1761 at the Cape of Good Hope. Mason and Dixon began work in 1763, and succeeded in running the tangent line with sufficient accuracy ; but at an early stage of the work it occurred to them to recommend to the Royal Society that advantage should be taken of this opportunity of measuring an arc of meridian, the first in North America. They then cut north to the agreed parallel 15 miles south of the southern point of the city of Pennsylvania, and thence westward along the parallel which is the actual Mason and Dixon line.

Within recent years this boundary has been re-surveyed by a mixed Commission under the Superintendent of the Coast and Geodetic Survey. They re-located the marks which had been lost, and the report published by the Maryland Geological Survey in 1908 gives an exhaustive account of the whole original dispute, and the bibliography of the documents for its study—failing singularly however to make clear the essential points, which are the terms of the original grants, and the manner in which the

boundaries were defined. The re-survey established the great accuracy of the work of Mason and Dixon, whose latitudes were only two or three seconds in error—a very creditable result for the time.

While the descent of our Theodolite from Jeremiah Dixon is completely established, it is not quite clear that the instrument was actually employed upon the boundary work, though research into the records of the survey preserved in Philadelphia and Baltimore may, it is hoped, throw light upon this question.

The instrument is in any case a welcome gift, as a personal relic of a man so well known in the history of Geography, and as a beautiful example of the workmanship of the period. Such gifts help to realize the ambition expressed by Sir Clements Markham in his recent paper, that the Society might possess a collection of instruments for navigation and survey representative of all periods.

A. R. H.

RAILWAY DEVELOPMENT OF AFRICA, PRESENT AND FUTURE.

Sir Charles Metcalfe, Bart.

Read at the Meeting of the Society, 29 November 1915. Map, p. 80.

THE outstanding feature of Africa has been its inaccessibility. This vast continent, covering one-fifth of the world's land area, with its enormous treasures of diamonds, gold, copper, tin, iron and coal, with its products of oil, rubber, coconuts, and such a wealth of tropical fruits that its millions of inhabitants can exist with a minimum of labour, with a great central plateau running for thousands of miles at such an altitude that white races can live and thrive in a climate that makes them reluctant to leave it, has yet, in spite of all these advantages, remained untraversed and unknown to the civilized world until comparatively recent times. The only accessible part of Africa, the Valley of the Nile, gives us our earliest historical record. A navigable river in a fairly temperate zone defended on either side by deserts gave all the factors that produced a high state of civilization when, as far as we know, the rest of the world was in a state of barbarism. South America and India resemble Africa in shape, but differ from it in this respect, that whereas they have in each case a mountain range running north and south on their western shore only, Africa has a formidable barrier varying in altitude generally from 3000 to 8000 feet all round its coastline, both on the west and on the east. The rivers south of the equator are very few and impossible for navigation except in some instances for a short distance, above which rapids, caused by the abrupt rise of the country, stop all access by boats to the interior,